Mid-Atlantic Network
Inventory Study Plan for Vertebrate and Vascular Plant Species

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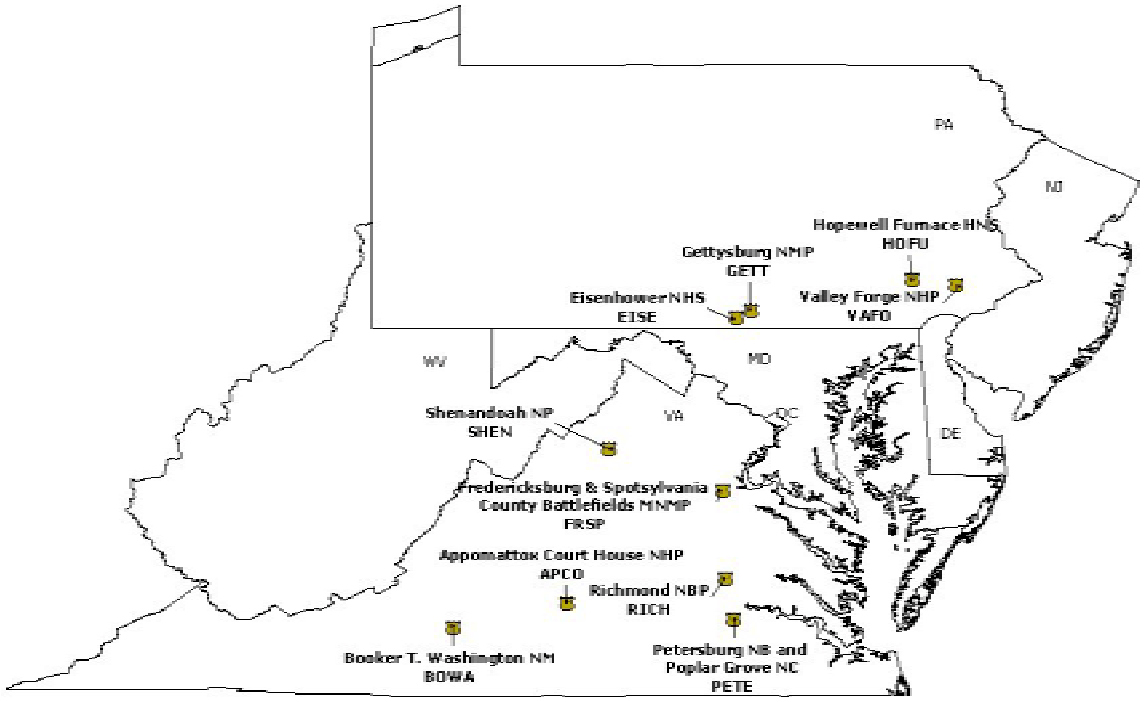
Appendix A

Mid-Atlantic Network VA parks Scoping Workshop

Mid-Atlantic and Coastal and Barrier Networks
VA parks Inventory Strategy:

A Report on the Scoping Workshop for Developing Biological Inventories

April 3, 2001
Richmond National Battlefield Park, VA



On April 3, 2001 seven park representatives from the Mid-Atlantic Network and two representing three parks from the Coastal and Barrier Network met at the Richmond National Battlefield Park in Richmond, VA, to formulate plans to inventory vertebrate and vascular plants in their parks (Table 1). This scoping workshop was held in response to the National Park Service's mission to address the need to inventory and monitor natural resources within the National Park System. When the Park Service began to evaluate their existing natural resource information, it became evident that many parks were lacking in basic, credible, scientific data about the nature and condition of these resources in their parks. In response to this lack of information, Congress has funded the Servicewide Inventory and Monitoring Program (I&M).

Table 1. Mid-Atlantic and Coastal and Barrier Network VA Parks

Mid-Atlantic Network Parks
- Booker T. Washington NHS
- Richmond National Battlefield Park
- Appomattox Court House NHS
- Petersburg National Battlefield Park
- Fredericksburg and Spotsylvania NMP
- Appalachian National Scenic Trail
- Shenandoah NP

Coastal and Barrier Network Parks
- Colonial National Monument
- Thomas Stone National Historic Site
- George Washington's Birth Place NM

Goals of the I&M Program consist of compiling and organizing existing data for all parks and then filling data gaps through targeted field investigations. Once this is complete, long-term monitoring programs will be established in each park to document ecosystem change. This will help to provide park managers with the groundwork to be able to formulate effective management strategies.

To attain the initial goal of the NPS I&M Program, filling data gaps through targeted field investigations, biological inventories will be designed to meet three objectives:

- To document through existing, verifiable data and targeted field investigations the occurrence of at least 90 percent of the species of vertebrates and vascular plants currently estimated to occur in the park.

- To describe the distribution and relative abundance of species of special concern such as Threatened and Endangered species, exotic, and other species of special management interest occurring within park boundaries.

- To provide the baseline information needed to develop a general monitoring strategy and design that can be implemented by parks once inventories have been completed, tailored to specific park threats and resources issues. (*Guidelines for Biological Inventories*, WASO 1999)

Identifying Park Inventory Needs

Overview of the Workshop

Local scientists were asked to attend the Mid-Atlantic and Coastal Network workshop to provide expert opinion and advice in developing plans for vertebrate and vascular plant inventories in these parks. Representatives from the National Capital Region and the Southeast (Blue Ridge Parkway) were also invited. The workshop included representatives from the VA Department of Recreation and Conservation Natural Heritage Program, VA Department of Game and Inland Fisheries, Frostburg University, VA Commonwealth University, the University of Richmond, William and Mary, USGS-Patuxent, and others (Appendix, Table 1). After a quick overview of the National I&M Program presented by Beth Johnson, the Northeast Region I&M Coordinator, people divided up into workgroups according to their expertise. The workgroups included; birds, plants, fish, mammals and herps. Discussions were based upon existing species information in the parks, gaps in the existing information for each taxa, and the development of baseline inventories to fill these gaps.

The process of identifying inventory needs began prior to the workshop. Each person attending received a description of each park, inventory status for vertebrates and vascular

plants in each park, the goals of the National I&M Program, and the objectives of the workshop. During the workshop each group was provided with the most up to date species lists to review, description of wetlands and a list of museum collections that have been searched for specimens collected in the parks. Each workgroup was given a list of guidelines to help them through the process of developing plans for inventories. These guidelines were as follows:

1. Review existing inventory data. (Species lists and park bibliographies provided)
2. Identify gaps in inventory data for each park, and then across the parks.
3. Prioritize inventories necessary to fill those gaps identified in step #2.
4. Articulate rationale for prioritization.
5. Describe how these species or habitats will be sampled. What is the best sampling design and effort involved?
6. Provide cost estimates for the surveys you have designed above.

At the end of the day, each workgroup presented what they had discussed and their suggestions for inventory plans to the entire group. The workgroup summaries are as follows.

Mammals

1. Review existing inventory data. (Species lists and park bibliographies provided)

Parks with no formal mammalian inventories and very little species data in NPSpecies include: PETE, APCO, GEWA, RICH, FRSP

COLO and BOWA have more complete mammal lists than the above parks. The group decided that both parks need further surveys simply because the ones that have already been done are either outdated or only covered one unit of the park.

2. Identify gaps in inventory data for each park, and then across the parks.

The group identified the various mammalian groups that should be inventoried for each park, they include: Bats, Shrews, Mice/rats, Squirrels, Weasels, Rabbits, Coyotes, and Exotics such as Nutria.

3. Prioritize inventories necessary to fill those gaps identified in step #2.

The priority is to complete baseline inventories in all the parks on all mammals. Bats in

particular, due to cost factors and expertise necessary to complete bat inventories, were considered separately.

4. Articulate rationale for prioritization.

Incomplete mammalian species data in all the parks

5. Describe how these species or habitats will be sampled. What is the best sampling design and effort involved?

The group identified the various mammalian groups that should be inventoried for each park, they include: Bats, Shrews, Mice/rats, Squirrels, Weasels, Rabbits, Coyotes, Exotics The workgroup identified various sampling protocols for each group of mammal, but did not develop a full sampling design.

6. Provide cost estimates for the surveys you have designed above.

$44,000 hire student technicians, $16,492 transportation, $980. Camping, $5040. 300 Sherman traps, $1200. 30 Tomahawk traps, $2560 4 mist nets, scales, misc. equipment. Total $74,271 3yr study/4 parks

Applied across all the parks:
Equipment is a one time cost- $8800
Technicians/travel/lodging- $16,368/park + 20% overhead = **$157,130 for 8 parks**
Appalachian Trail $46,000 + 20% overhead = **$55,000**

The mammal group also spent time identifying RTE species for each of the parks and came up with the matrix below.

Species of Concern	**COLO**	**Mid-Atlantic**	**App. Trail**	**BOWA**
Med/Large Mammals	Marsh Rabbit Delmarva Fox Squirrel Nutria		Appalachian Cotton Tail	Appalachian Cotton Tail River Otter ?
Small Mammals	Star-nosed Mole	Star-nosed Mole	Star-nosed Mole Allegheny Wood Rat	Star-nosed Mole
Shrews (9 species)				
Bats	Eastern Big- eared Bat	Eastern Big- eared Bat	Indiana Bat Small-footed Myotis	Eastern Big- eared Bat

Amphibians and Reptiles

1. Review existing inventory data. (Species lists and park bibliographies provided)

Herpetological information is basically non-existent for most of the parks, except for GEWA and COLO.

- GEWA-Eckerlin, 1991
- COLO-VDNH, 2001 for -sinkholes only-Yorktown, COLO-Joe Mitchell JI 400 (in progress), COLO-Bradshaw 1998

2. Identify gaps in inventory data for each park, and then across the parks.

Probability of reaching the 90% goal:
Anurans-----high
Salamander-----moderate-high
Turtles-----high
Lizards-----moderate
Snakes-----low

3. Prioritize inventories necessary to fill those gaps identified in step #2.

The Herp group did a park-by-park review of potential herp habitat. See each park below. They then identified important features and prioritized the parks based upon the number of potential features each might have.
Park Features:

- Size/acreage of undeveloped lands
- Habitat type (priority)
- RTE potential
- Geographical considerations (lower coastal plain vs. inner Piedmont)

Park Prioritization:

1) COLO
2) PETE
3) FRSP/RICH
4) APCO
5) BOWA
6) GEWA
7) THST

AT administered separately

4. Articulate rationale for prioritization.
Available data and its incompleteness.

5. Describe how these species or habitats will be sampled. What is the best sampling design and effort involved?

Inventories should cover a 3 year period in order to account for weather patterns (drought/wet years) and seasonal activity patterns.
Best available SOP should be considered-multiple techniques should be used.
Knowledgeable, experienced field crew important.

Key- Site visits/Reconn. time on site.

6. Provide cost estimates for the surveys you have designed above.

$125-$150/year
Field Reconnaissance needs to be done before an accurate budget can be developed.

Park by Park Review

APCO

a) Potential RTE: Big-headed Mole Salamander (*Ambystoma talpoideum*)
b) Isolated wetlands/ uplands (Habitat Mgt.)
c) Riparian Zone Mgt.
d) Hardwood Forest (quality and fragment size and proximity to wetlands)
e) Springs and seeps

BOWA

a) No potential RTE expected
b) Isolated wetlands/ uplands (Habitat Mgt.)
c) Riparian Zone Mgt.
d) Hardwood Forest (quality and fragment size and proximity to wetlands)

FRSP

a) No potential RTE expected
b) Isolated wetlands/ uplands (Habitat Mgt.) (+ earthworks)
c) Riparian Zone Mgt.
d) Hardwood Forest (quality and fragment size and proximity to wetlands)
e) Springs and seeps

RICH

a) No potential RTE expected
b) Isolated wetlands/ uplands (Habitat Mgt.) (+ earthworks)
c) Riparian Zone Mgt.
d) Hardwood Forest (quality and fragment size and proximity to wetlands)
e) Springs and seeps
f) Swamps and Marshes

PETE

a) No potential RTE expected
b) Isolated wetlands/ uplands (Habitat Mgt.) (+ earthworks)
c) Riparian Zone Mgt.
d) Hardwood Forest (quality and fragment size and proximity to wetlands)
e) Springs and seeps
f) Swamps and Marshes
g) Cottonmouth-special mgt./educational concerns

GEWA

a) No potential RTE expected
b) Isolated wetlands/ uplands (Habitat Mgt.) (+ earthworks)
c) Riparian Zone Mgt.
d) Hardwood Forest (quality and fragment size and proximity to wetlands)
e) Springs and seeps
f) Swamps and Marshes

g) Sea Turtle strandings

COLO

a) Potential RTE: Mabee's Salamander (*Ambystoma mabeei*)
b) Isolated wetlands/ uplands (extensive)
c) Riparian Zone/ Floodplains
d) Hardwood Forest (quality and fragment size and proximity to wetlands)
e) Springs and seeps (extensive)
f) Turtle nesting areas (predation)
g) Breeding migrations/road mortality

Appalachian Trail

a) Potential RTE: 1. Peaks of Otter Salamander 2. All salamander species @ Jefferson issues associated with: The Priest Mountain/Three Ridges
b) Isolated wetlands/ uplands (minor issues) bogs?
c) Riparian Zone/ Floodplains
d) Hardwood Forest (quality and fragment size and proximity to wetlands)
e) Springs and seeps (extensive)
f) Rattlesnake dens
h) Habitat fragmentation

Fish

The fish group discussed inventories park by park.

	APCO
Review of existing data	Riverine (Appomat. + trib) 8.5 miles Wetlands (84 acres) No fish collections listed DGIF: Fish collections (1997-Appomattox) 160-m section
Gaps	Springs Wetlands Headwaters Only have 1 data point
Prioritize Inventory	Stratify and quantify inventory across habitat types Determine habitat types Example: perennial streams (smaller, 2, 3 order) Appomattox River (upper and lower sections at least)
Rationale	Existing data are limited and question validity
Sampling Regime	ID habitat types and number of each type to sample Best sampling design and effort? Recommendations: Coordinate with other agencies (i.e. SHEN); Electrofishing and seining will be late spring/early fall (Sept.) habitat dependent. Grazing on parkland-cows in the stream Mussel survey (RTE species: Atlantic pigtoe mussel (*Fusconaia masoni*) in upper stretch of Appomattox River) (work with

	fisheries)
Cost Estimate	Approximately 4 people x 1 week for fish and mussel surveys $250/person/day = surveys $5000 + $2500 = $7500 (maximum) (includes report writing, etc…) Supplies and equipment would be supplied by partners.

	BOWA
1) **Review of existing data**	Very limited Habitats: small streams; springs ; cool and warm water
2) **Gaps**	No data!
3) **Prioritize Inventory**	Only streams Stratify across habitat types (size, water source (spring, runoff)) Mainstems and Tribs Fish, possibly unique spring fauna
4) **Rationale**	Existing data are limited. Need to develop baseline.
5) **Sampling Regime**	ID habitat types + number of each to sample. **Recommendations:** Electrofishing, other if needed (habitat dependent), Coordinate across agencies Late spring/early fall
6) **Cost Estimate**	4 people x 2 days = $3,000 (2k fieldwork, 1k Reports/data)

	COLO
1) **Review of existing data**	Confident species list is 90%. Nothing needed immediately ▪ Extensive recent sampling (1997) ▪ Backpack, boat, electrofishing + trawl
2) **Gaps**	none
3) **Prioritize Inventory**	
4) **Rationale**	
5) **Sampling Regime**	**Recommendation**- re-survey in 5-10 years using same methods and gear. Freshwater benthos inventory is complete
6) **Cost Estimate**	

	FRSP

1) **Review of existing data**	Need further information on the extent of wetlands at FRSP
2) **Gaps**	
3) **Prioritize Inventory**	
4) **Rationale**	
5) **Sampling Regime**	field reconnaissance to assess aquatic habitats.
6) **Cost Estimate**	

	GEWA
1) **Review of existing data**	Limited data need baseline inventory-Check VIMS Aquatic Habitats Streams-tidal, freshwater, brackish Wetlands-freshwater, brackish, saltwater Ponds
2) **Gaps**	
3) **Prioritize Inventory**	Pope's Creek ▪ Spring sampling for anadramous species ▪ Other seasons for other fish, shellfish, crabs Marshes (Potential nurseries) ▪ Stratify across types Ponds (low priority) SAV's, waterfowl – research topics?
4) **Rationale**	Need baseline inventories
5) **Sampling Regime**	Pope's Creek- electrofishing (boat) beach seine (possible invertebrates) trawl (at mouth) Marshes-Minnow traps, Seining Ponds- Boat electrofishing, Late spring-early fall, Early spring-anadramous species
6) **Cost Estimate**	Pope's Creek- quarterly sampling (diverse habitats, fauna) 1 boat: 3 people x 4 days (per year) $3K for fieldwork + $1K for data/reports Seine/ trawl (2 x per year): 4 people x 6 days (per year) = $6k fieldwork + $2.5K data/reports Marshes: Traps (need recommendations from VIMS) Ponds: Rod and Reel Need to evaluate access/needs

	THST
1) **Review of existing data**	none-check MD-DNR, Universities Existing aquatic habitats 1 pond (artificial) 1 perennial stream springs, seeps, intermittent streams

2) **Gaps**	Baseline data
3) **Prioritize Inventory**	Stream-Hoghole Run Others if needed
4) **Rationale**	Need baseline data
5) **Sampling Regime**	Stream-Electrofishing (backpack) Seine (if needed) Late spring-early fall Pond-Boat electrofishing
6) **Cost Estimate**	3 people x 1 day = $750 fieldwork + $250 data/report = $1K

	PETE
1) **Review of existing data**	Little data Aquatic habitats Perennial streams (6) Harrison, Branch, Poor (all on main unit) Ponds (3) 1-1 acre pond (main unit) 1-1 acre pond (5 forks) Grant's Cabin (Shoreline) 1-beaver dam 1-pond (5 forks) Volunteer macroinvert sampling
2) **Gaps**	
3) **Prioritize Inventory**	Streams: Stratify habitats Ponds: Beaver ponds/artificial ponds
4) **Rationale**	Limited data
5) **Sampling Regime**	Streams: Backpack electrofishing Seining-habitat dependent Ponds: Boat electrofishing (if access) Rod and Reel Late spring-early fall
6) **Cost Estimate**	2 people x 1 week = $3750 fieldwork + $1K data/report = $4750

	RICH
1) **Review of existing data**	Maybe WWSS (DGIF) Aquatic Habitats Approximately 4 perennial streams
2) **Gaps**	Limited data
3) **Prioritize Inventory**	Streams- stratify by habitat type
4) **Rationale**	Need baseline data

5) **Sampling Regime**	Backpack electrofishing on boat as needed Seining-habitat dependent
6) **Cost Estimate**	2 people x 3-4 days = $2250-$3000 fieldwork + $1K data/report

Grand Total for all fisheries inventories = $36K

Summary Matrix

Park	**Existing Data**	**Backpack Electro**	**Boat Electro**	**Netting (Seine, trawl…)**	**Cost Estimate**
APCO	Some	x		x	7.5K
BOWA	None	x			3K
COLO	Lots				-
FRSP	None	x			?
GEWA	None		x	x	14K
THST	None	X			1K
PETE	None	x	x		4.8K
RICH	None	x			4K
SHEN	Monitoring in place				

In the end, the group suggested that if each park could query the DGIF Wildlife Information database and identify sampling gaps, that each park could then work with the district DGIF biologists to set up further sampling. Probably the most efficient way to do this would be to hire someone to query the database, identify gaps and then organize the field sampling.

Just as a note, Dr. Jay Stauffer from Penn State has entered into a cooperative agreement with the Northeast Region to locate fish voucher specimens in museum collections throughout the Northeast. This will include identifying vouchers collected in the Virginia parks. Once this is completed, Summer 2001, we will be able to use this information to identify gaps as well.

Vouchering Discussion
-few exceptions, but most species have wide distribution
-reference collection for training, referral

-confusing taxa (Notropis)
-juveniles vs. adults
-Mussels
-Photo documentation

Birds

1. Review existing inventory data. (Species lists and park bibliographies provided)

COLO-VA Tech Collection and William and Mary Collection
APCO-Partial BBS Route (contact Jeff Trollinger)
GEWA-Breeding Bird Atlas Data (?), FWS Waterfowl Counts (Gary Costanza VA Fog)
Evaluate existing info (interview park resource manager)
THST-Interview Ann Rasberry (MD DNR)
PETE-See Fort Lee Army Installation Report (Watts 1999)

2. Identify gaps in inventory data for each park, and then across the parks.
Baseline surveys for all parks except COLO
COLO may need baseline where current surveys are non-existent

3. Prioritize inventories necessary to fill those gaps identified in step #2.
All parks need baseline inventories.

4. Articulate rationale for prioritization.
No current information

5. Describe how these species or habitats will be sampled. What is the best sampling design and effort involved?
Small Parks-few major habitat-Volunteers, Low cost, Low intensity
Point counts + Special habitat searches by bird group (nocturnal, etc…)
Random replicates spatially distributed, seasonally

6. Provide cost estimates for the surveys you have designed above.
1000 acres/habitat---30 points----$6,000 VCP's ?
22,000acres (VA parks) x 6 = $132,000 for baseline inventories

Baseline Protocol Considerations

Habitats

- Forest
- Wetlands
- Grasslands
- Shoreline
- Developed Areas

Focus Groups

- Nocturnal species
- Migratory species
- Waterbirds
- Raptors
- Species of Concern

Time

- Breeding
- Wintering
- Migration

Habitats Prioritized

- Low- Developed areas
- High-Grasslands and wetlands

Park-Species-Habitat Combinations for focused inventories

- COLO-Red Cockaded woodpecker-Pine Forest-P/A
- COLO-Wetlands-breeding-P/A for Least Bittern, King Rail
- AT-Winter Wren, Bewicks Wren-breeding-P/A
- Pete-Colonial Waterbirds

Plants

The VA parks in the Mid-Atlantic and Coastal and Barrier Network, except for SHEN, and the AT will all have vegetation sampling done as part of a vegetation mapping project. Once these plots are sampled, species lists should be 75% complete for each of these parks.

Existing inventory data.

AT-No veg plots planned (17, 700 acres north of SHEN)
SHEN- look for additional funds to add to SHEN Veg Map effort.
Overall RTE data better than rest of data (50-90% verts, 70-90% plants)
APCO-90% complete-no gaps, collate existing data
BOWA-SWP survey (May 15-Aug 1), Collate existing data
COLO-75% complete after veg map plots complete, Check on exotics
FRSP-75% complete after veg map plots complete, RTE needed (extensive), Check on Exotics
GEWA-75% complete after veg map plots complete, collate previous surveys plots-enhance to 90%, no RTE needed, check on exotics
THST-No information currently (322 acres), 75% complete after veg map plots complete, RTE needed, Exotics needed
PETE-75% complete after veg map plots complete, check exotics (mapping)
RICH-Same as PETE
SHEN-RTE-60-70%, Invertebrates-1-2%, Vertebrates- 90%+

Matrix of existing information and data gaps(1= High; 5= Low; 6= Complete)

		90%	RTE	RTE Status	Invasives	Data Summary
15	APCO	6	5	No known/none	3	1
13	BOWA	4	5	No known/none	3	1
10	COLO	3	3	15 known/5 more	3	1
7	FRSP	2	1	2 known/5-10 more	3	1
13	GEWA	4	5	None	3	1
12	PETE	3	5	None	3	1
12	RICH	3	5	None/Possibly one	3	1
6	ATPO	1	2		2	1
7	THST	1	4	Possibly 1-2	1	1

Proposed Projects

1. <u>Data Summary and Invasive Species 2002-2005</u>

<u>Phase 1- 2002</u>
Summarize existing literature, records, and species lists for all 9 parks

Budget

Personnel- GS-09 term $47,500
Travel $2,000
GSA Vehicle $2,000
Supplies and Equipment- $2, 500 ~ $54,000

<u>Phase 2- 2003-2004</u>
Invasive Species Data Collection

Budget

Personnel- GS-09 term $95,000
- GS 05 seasonal $50,000

Travel $15,000
Vehicle $ 5,000
Supplies and Equipment $10,000

Total $175,000

<u>Phase 3- 2005</u>
Part of Phase 2 collating species lists (using veg. Classification data)

Budget
Personnel- GS-09 term $47,500
Travel $2,000

GSA Vehicle $2,000
Supplies and Equipment $1500

Total $53,000

Grand Total $282,000

2. RT&E
Division of Natural Heritage will reconfirm known RT&E locations and digitize boundaries $80,000

DNH will find new RT&E locations and digitize boundaries $70,000

3. Reaching 90%
75% plot data-→ 90% complete. Use cooperators at Universities to complete the inventories to 90% after veg mapping project is complete. Cooperative agreements ~ $80,000

Inventory Goals for the Mid-Atlantic and Coastal and Barrier Network VA parks

The next step is to develop an inventory study plan for each of these networks that will be submitted to the National I&M office for review and evaluation by October 1, 2001. These plans, the Mid-Atlantic Network study plan and the Coastal and Barrier Network study plan will describe the network goals to inventory vertebrates and vascular plants over the next 4-5 years. Again, the purpose of this scoping workshop was to bring together local experts to help the parks determine and prioritize their inventory needs and identify possible cooperators. It was evident from the discussion at the workshop that all of the parks, except Shenandoah and Colonial, are lacking in baseline vertebrate and vascular plant data. Species lists are sparse and non verifiable at this point and the first goal is to begin baseline inventories and develop scientifically verifiable lists for each park.

In the next few months, the Regional Inventory and Monitoring Coordinator and staff will:

1. Contact prospective cooperators who might be interested in completing inventories on birds, mammals and herps in all the VA parks.

2. Organize the search for park fisheries data in the VA DGIF Wildlife database, determine gaps and contact local biologists to complete sampling. Kristen Gounaris Allen at Richmond National Battlefield Park has made some initial contacts with VADGIF.

3. Continue to contact museums and institutions to locate voucher specimens that may have been collected in the parks. This will be continued by a Research Associate hired through Penn State University.

4. Begin the clean up of the web based NPSpecies database and verify existing records. This will be done by a Research Associate, Keely Ann Tolley at Penn State University.

5. Network study plans due October 1, 2001.

Contacts made to date:

1. Dr. Ron Barry, Frostburg State University and Dr. John Pagels, Virginia Commonwealth University. Possible cooperators-Mammal inventories.

2. Dr. Joe Mitchell, University of Virginia. Possible cooperator-Herp inventories.

3. DGIF-Completion of Fisheries Inventories

Appendix A

Workgroup Participant Lists

Mid-Atlantic and Coastal and Barrier Network VA Parks

Scoping Workshop

April 3, 2001

Richmond National Battlefield Park

Mammal Workgroup

Timothy Blumenschine	1539 Hickory Hill Lane Petersburg, VA 23803	804-732-0171	Tim_Blumenschine@nps.gov	Mammals
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Kristen G. Allen	Richmond National Battlefield Park 3215 E. Brood St. Richmond, VA 23225	804-795-5019	Kristen_gounaris@nps.gov	Plant ecology/general ecology
John Pagels	Dept of Biology Virginia Commonwealth University Box 842012 Richmond, VA 23284-2012	804-828-1562	Jpagels@maill.vcu.edu	Mammals
John Karish	NPS 209B Ferguson Bldg. University park, PA 16802	814-865-7974	John_karish@nps.gov	Forestry/research admin.

Fish Workgroup

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Tom Shahady	Lynchburg College 1501 Lakeside Drive Lynchburg, VA 24501	804-544-8545	Shahady_t@mail.lynchburg.edu	Freshwater Biology
John Galvez, PhD	USFWS 6669 Short Lane Gloucester, VA 23061	804-693-7118	John_galvez@fws.gov	Fisheries
Shelly Miller	VADGIF 4010 W. Broad Street Richmond, VA 23230	804-367-0909	Smiller@dgif.state.va.us	Aquatic ecology, fish, mussels, herps
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Gary Swihart	USFWS 6669 Short Lane Gloucester, VA 23061 Gloucester office of fisheries assistance	804-693-7118	Gary_swihart@fws.gov	Fisheries-Baseline inventories. Rec. fishing management plans.Water quality for fisheries, Habitat eval. Freshwater/Marine
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Plants

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Gary Somers	Shenandoah National Park 3655 US Hwy 211E Luray, VA 22835	540-999-3491	Gary_somers@nps.gov	Di Cu
Chris Ludwig	Division of Natural Heritage VA DCR 217 Governor St Richmond, VA 23210	804-371-6206	jcludwig@dcr.state.va.us	RT
Tim McCormick	PO Box 1484 Ferrum, VA 24088	540-365-2549		Bo BO
Kent Schwarzkopf	Appalachian Nat. Scenic Trail Harpers Ferry Center Harpers Ferry, WV 25425	304-535-6767	Kent_schwarzkopf@nps.gov	Va
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Nancy Cowden	Biology Program Lynchburg College 1501 lakeside Drive Lynchburg, VA 24501	804-544-8371	Cowden_N@mail.lynchburg.edu	Va

Herps

Dr. Joseph Mitchell	Dept. of Biology University of Richmond Richmond, VA 23173	804-740-7086	Jmitchell@richmond.edu	All
Mike Hayslett	Holiday Lake 4-H Ed. Center Rt 2, Box 630 Appomattox, VA 24522	804-248-5444	mhayslet@vt.edu	Iso
Steve Roble	VA DCR 217 Governor St Richmond, VA 23210	804-786-8633	Sroble@dcr.state.va.us	All
Chuck Rafkind	NPS-Colonial NP		Chuck_rafkind@nps.gov	

Eastern Rivers and Mountains Network
Inventory Study Plan for Vertebrate and Vascular Plant Species

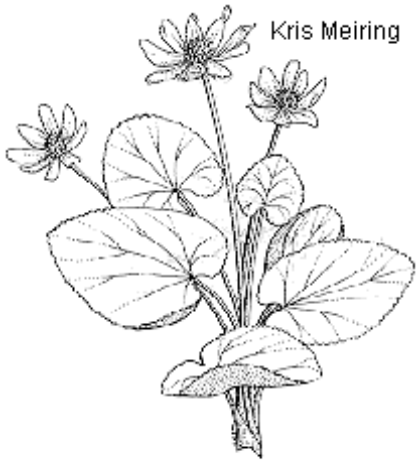
Appendix B

Northeast Region Product Specifications

The National Park Service

Northeast Region I&M Program

Product Specifications



Caltha leptosepala

Introduction

The National Park Service (NPS) Inventory and Monitoring (I&M) Program is in the initial stages of developing Product Specifications. The current specifications may change as the program develops, and especially as data management programs evolve. This document was written to provide cooperators/contractors with a straightforward list of deliverables that are required at the completion of each biological inventory project. If any inconsistencies or errors are detected, please contact Sara Stevens at 401-874-2930 or sara@edc.uri.edu.

Cooperators and contractors are to provide the following deliverables (specifications are described in this document and in greater detail at http://www.nature.nps.gov/im/apps/specs/):

1. Species Data

Raw Data
Copies of all raw data, such as hand written field forms (if used), must be provided if requested. Do not destroy any forms without first contacting Sara Stevens for permission.

Species Inventory Database
All inventory data must be provided in an MS Access database. Database templates are being developed for inventory and monitoring data. Available templates and a data dictionary can be found at: http://www1.nature.nps.gov/im/apps/template/. If a template is available that is applicable to the protocol you are using, please use it. Dependent upon the individual project and data collected, cooperators can add additional fields.

Eventually, all data collected for the I&M Program will be linked to the NPS GIS Theme Manager so that parks can easily access maps showing species locations and data collected in their park. In order for databases to be linked to the NPS GIS Theme Manager, it is mandatory that your MS Access databases contain a Locations table, an Events table, and a Sampling Component table. Please see the mandatory tables and associated field requirements in the appendix (section I).

2. GPS Data

Cooperators must provide GPS coordinates and attributes (e.g. location ID, description, and habitat classification) for all fixed sampling locations (e.g. plots, transects, etc…). Cooperators are also encouraged to obtain GPS coordinates and attributes for observations obtained from general search areas or opportunistic sightings, but are not required to do so. GPS data must be differentially corrected with base station files. The data should be supplied as an ArcInfo coverage or as an ArcView shapefile in the coordinate system currently in use at the park. For most parks, this will be the correct UTM zone in which the park is found. The datum should be the North American Datum of 1983 (NAD83); the ellipsoid should be the Geodetic Reference System 80 (GRS80); and units of measure should be meters. Please review the GPS standard operating procedures for field data collection and the spatial data format requirements in the Appendix (Sections II& III).

3. Metadata

Non-spatial digital data
Metadata must be provided in NPS Dataset Catalog format for each non-spatial digital data set produced. The data entry form is provided in the Appendix (Section IV).

Spatial digital data
Cooperators must provide metadata for each spatial digital data set (e.g. GPS coverage of fixed sampling locations) produced. All metadata must follow Federal Geographic Data Committee (FGDC) compliance standards which can be found at http://www.fgdc.gov/metadata/metadata.html. NPS data managers familiar with creating FGDC metadata will assist the cooperator with the development of metadata. Please fill out the metadata questionnaire in the Appendix (Section V) prior to contacting NPS staff for assistance.

4. Voucher Specimens

The I&M program has requested that vertebrates and vascular plants existing in parks be documented either through voucher specimens or scientific references. The Northeast Region I&M Program chooses to leave the issue of vouchering up to the discretion of the park where the inventory is taking place. An agreement on vouchering must be reached prior to beginning the inventory. See Section VI of the Appendix for guidance on vouchering.

5. Reports

Progress Reports

Progress reports must be submitted digitally in Word format, and as paper copy if requested. Minimally, they will be due annually dependent upon the length and scope of the project. See Section VII of the Appendix for report guidelines.

Final Reports

The final report must first be submitted digitally as draft in MS Word, and as paper copy if requested, to the Regional I&M or Network Coordinator for management and scientific review and comment. It must include methodology, analysis, results and discussion. The final report must be submitted in digital and paper copy (if requested) formats. Because the final report will be made available on an NPS website, it must be submitted both as 1) a Word 6.0 or higher version document (.doc) in its entirety on diskette or CD-ROM, and 2) a Word 6.0 or higher version document (.doc) containing all text and tables, and individual Tiff documents (.tif) for each graphic image contained in the report on that same diskette or CD-ROM. See Section VII of the Appendix for report guidelines. Cooperators are responsible for submitting all other required products with or prior to the final report.

APPENDIX

Section I	Mandatory Tables and Fields for Relational Database
Section II	Field Data Collection with Global Positioning Systems
Section III	Spatial Data format
Section IV	Dataset Catalog Entry Form (Complete for all Non Spatial Data)
Section V	FDGC Metadata Questionnaire (Complete for all Spatial Data)
Section VI	Voucher Specimen Collection
Section VII	Report Guidelines

Section I

Mandatory Tables and Fields for Relational Databases

The following three tables must be included in all species inventory databases submitted to the NPS I&M Program. The listed fields are mandatory because of relationships with other tables or for use with the GIS Theme Manager. Primary Keys are noted in bold type. For more information about the NPS database templates and relational database please visit the following website, http://www1.nature.nps.gov/im/apps/template/

Locations Table

ParkCode: Identify the 4-character NPS unit code. This code is necessary because many of the databases will be managed at the network level, and it is important to identify which data were collected in which parks.
Program: This is a 1-10 character code that describes which component of the overall inventory and monitoring program the data pertain to such as water quality monitoring, vegetation plots, bird monitoring, bat monitoring, soil erosion, etc. (e.g. VEGPLOT for vegetation plots, BVCP for bird VCP counts). There are no National Park Service standards or naming conventions for developing this code.

LocationID: This is a 1-50 character code that uniquely identifies a sampling location or sampling unit (e.g., a plot, transect, stream segment, or sampling station). To allow different parks and PIs to work independently, we recommend that the LocationID include the 4-character ParkCode, the Program code, and some combination of characters that, when combined, will uniquely identify the location. For example, ACAD_HERPS_ACC0001 could be the LocationID code for amphibian call count station #1 in Acadia NP and ACAD_VEGPL_0123 could be the LocationID code for vegetation plot number 123

Descript: This is a field that provides a brief description of the unique sampling location identified by the LocationID field (up to 200 characters in length).

StartUTMX: Identify the UTMX (easting) coordinate for the center of the plot OR the starting point of a line or polygon. The field should represent the data in the following manner: data type = number; field size = double (double precision floating point, 15 significant figures); decimal places = auto. Double precision to 15 significant digits should be maintained.

StartUTMY: Identify the UTMY (northing) coordinate for the center of the plot OR the starting point of a line or polygon. The field should represent the data in the following manner: data type = number; field size = double (double precision floating point, 15 significant figures); decimal places = auto. Double precision to 15 significant digits should be maintained to allow millimeter accuracy.

StopUTMX: Identify the UTMX (easting) coordinate for the ending point of a line or polygon. The field should represent the data in the following manner: data type =

number; field size = double (double precision floating point, 15 significant figures); decimal places = auto.

StopUTMY: Identify the UTMY (northing) coordinate for the ending point of a line or polygon. The field should represent the data in the following manner: data type = number; field size = double (double precision floating point, 15 significant figures); decimal places = auto.

UTMZone: Identify the UTM zone (zones 1-52). This information is required if coordinates are specified with the UTM grid coordinate system. UTMZone is defined as a Text field to accommodate data collected by PLUGR GPS units that record zone as 15T.

Datum: Identify the reference system used for defining the coordinates of points (i.e. North American Datum of 1983 (NAD83).

EstHError (Estimated Horizontal Error): Calculate the "error buffer" associated with the x,y coordinates for the location. This value makes it possible with a GIS to show the uncertainty associated with a location, depending on how the coordinates for that location were obtained. Report error in meters (or some fraction of a meter if available). The required Federal reporting standard in the horizontal component is the radius of a circle of uncertainty, such that the true or theoretical location of the point falls within that circle 95% of the time.

Determining horizontal error from maps:

For maps on publication scales larger than 1:20,000, error, in inches, is calculated by multiplying the scale by 1/30, for maps on publication scales of 1:20,000 or smaller, the muliplier is 1/50.

Determining horizontal error from GPS data:

If using a Global Positioning System (GPS) to determine the spatial coordinates, accuracy varies and is dependent on a number of values (e.g., maximum PDOP and minimum number of satellites). For point data, when you export a file from Pathfinder Office (PFO), point features have an instantaneous attribute value for Vertical Precision, Horizontal Precision and Standard Deviation. Use the Standard Deviation to determine the value of Estimated Horizontal Error. For line and polygon data, accuracy cannot be clearly determined (according to Trimble), and we recommend that you enter the horizontal error for the starting point as an approximation of the positional error associated with the line.

Events Table

LocationID: See description under "Locations Table" above.

EventID: This code, in conjunction with the LocationID field, provides a unique identifier for the starting time of a particular sampling event. The duration of a sampling event may be minutes, hours, or days, depending on what is being sampled. We recommend a code that includes the Program code, the date in a format of YYYYMMDD for cases where only one sampling event can occur each day, or YYYYMMDDhhmm (24 hour clock) where a field crew may conduct many sampling events in the same day for a particular component. For example, a code of LBIRD_20000711_0730 might be entered for a 5-minute sampling period for land birds that began at 7:30 am on July 11, 2000.

Year: Identify the year the sampling occurred.

StartDate: Identify the date (YYYYMMDD) when sampling began.

EndDate: Identify the date (YYYYMMDD) when sampling ended.

Sampling Component Tables

LocationID: see description under "Locations Table" above.

EventID: see description under "Events Table" above.

Each component of an inventory and monitoring program (e.g., water quality monitoring, vegetation plots, bird monitoring, bat monitoring) will require one or more tables to store the data for that component. The table structure and fields in these tables will be determined by the sampling protocol. For example, a coastal park may have separate tables for land birds, shorebirds, marsh birds, and nest surveys because different sampling protocols are used and different types of data are collected for each component.

The LocationID and EventID fields should be included in each component's table as foreign key fields. The primary key for a component table could either be a composite key that includes these two fields plus some identifier that makes each record unique, or it could be an autonumber or other record identifier that uniquely references each record in the table.

Section II

Field Data Collection with Global Positioning Systems
Standard Operating Procedures and Guidelines

The purpose of this section is to complement the (Draft) Natural Resources Data and Information Handbook (NRDIH). This section addresses instrument settings, field operation and data processing for GPS data collection only. It does not address the important issues of database design, applicable scientific measurement protocols, data verification/validation, data documentation, data maintenance, archiving, security or distribution. Please consult the NRDIH for further information on those critical subjects.

Positional Data:

The National Map Accuracy Standard (NMAS) published by the USGS is the NPS *minimum* standard for map data accuracy. Typically a GPS will provide much better accuracy then NMAS if it is used carefully and with full attention to the parameters that the user can set or track. To achieve a reasonable and reliable level of accuracy with a GPS, please use the parameter settings described below. Please note that different GPS units use different names for these parameters or define them slightly differently. The discussion below tries to accommodate for these differences. For further discussion of the significance of these parameters and rationale for the recommended settings please see the NRDIH. If you have any questions please contact Tim Smith at Tim_Smith@nps.gov.

Definition of the Global Positioning System

GPS (Global Positioning System) is currently a constellation of 25 Department of Defense satellites that orbit the earth approximately every 12 hours, emitting signals to Earth at precisely the same time. The position and time information transmitted by these satellites is used by a GPS receiver to trilaterate a location on the earth using three or more satellites to determine a coordinate on earth.

The satellites broadcast on two carrier frequencies in the L-band of the electromagnetic spectrum. One is the "L1" or 1575.42MHz and the other is "L2" or 1227.6MHz. On these carrier frequencies are broadcast codes, much like a radio or television station broadcast information on their channels (frequencies). The satellites broadcast two codes, a military-only encrypted code (PPS) and a civil-access or Standard Positioning (SPS) code.

GPS Receivers

All commercial consumer GPS receivers are SPS (Standard Position Service) receivers. There are two basic types of SPS receivers, those that use the broadcasted code to do their positioning (code-phase) and those that do carrier phase measurements (carrier-phase). PPS (Precise Position Service) or P(Y)-Code (Rockwell PLGR and Trimble Centurion) receivers utilize the P(Y)-code broadcast on the L2 carrier frequency for positioning. This type of receiver is only available to the military and some government agencies.

GPS Positional Accuracy

Positional accuracy for autonomous, code-phase, resource grade or C/A-code receivers range from 100 meters to less than 2 meters. Accuracy for carrier-phase units (commonly referred to as geodetic receivers) can be measured in millimeters.

Accuracy is dependent on a number of factors. Several factors that can significantly impact data accuracy can be monitored in the field: the number of satellite vehicles, Positional Dilution of Precision (PDOP) and Estimated Horizontal Error (EHE). One should always acquire at least 4 satellites. This gives you a 3D position. More satellites are better than fewer. PDOP relates to satellite geometry at a given time and location. Keep the PDOP as low as possible (ideally, maximum PDOP=4) when collecting mapping data. Some receivers have the ability to stop collection of a position if the PDOP value rises too high. This is referred to as "PDOP masking". Most receivers (but not all) give you a field estimate of horizontal error (EHE or EPE). With the Rockwell PLGR and Garmin GPS III Plus, the EHE (or EPE) has been shown to be a very good indicator of overall positional accuracy (most of the time your accuracy is going to be better than the EHE). In the field, EHE is not presently available on the Trimble GeoExplorer 3.

Positional accuracy for both C/A Code and Carrier types of receivers strongly depends on a process called differential correction. In order to achieve greater accuracy, the differential correction procedure is used to limit Selective Availability (controlled by the Department of Defence [DoD]) and Ionospheric/Tropospheric degredation of the satellite signals. Although DoD has now set Selective Availability degredation to zero, Ionospheric / Tropospheric degradation can add from 1 - 7 meters of error to your position. Therefore, differential corrections are required to improve accuracy, maintain positional integrity (confidence), and make a survey tie to a ground-based geodetic survey network.

Real-time differential corrections should be used whenever possible. This saves both time and money. Real-time differential corrections are available through the NDGPS/Coast Guard Beacon System, the WAAS (FAA) satellite based differential system, OmniStar, or a variety of paid private differential services.

Receiver Specific Recommended Settings:
<u>Garmin and PLGR units:</u>

1. *EHE*: less then or equal to 12 (this will keep you just within the NMAS for a 1:24,000 map, which is the maximum acceptable for GPS in the eastern parks).
2. *Minimum of 4 satellites (3D)* for every position.
3. *Position Type*: real-time differentially corrected position.

<u>Trimble Units</u> (GeoExplorers, Pathfinder Pros)

1. *PDOP*: less then or equal to 5 (we recommend starting with a PDOP maximum of 4 and shifting to 5 if data collection is not successful at 4;this will keep you around the NMAS for a 1:5,000 map).
2. *Minimum of 4 satellites (3D)* for every position.
3. *SNR*: less then or equal to 5.
4. *Elevation Mask*: 15.
5. *Antenna height*: be sure to check for correct antenna height setting. This setting should be the typical height at which the antenna will be carried. If the antenna is attached to a pole, it must be located above the user's head and the antenna height setting should be the height of the top of the pole. Wherever possible, the antenna should be clear of any obstructions.
6. *Position Type*: must be post-processed or real-time differentially corrected.

All GPS units:

1. Check the graphics data collection screen regularly to see if you are getting multi-path or other apparent distortions to the data.
2. Be aware of the possibility of multi-path interference and use offsets or other methods to keep the antenna away from building overhangs, tall fences or walls, and heavy canopy wherever possible.
3. ALWAYS do differential correction, either real-time or post processed
4. Feature settings:

   Point

   - *Trimble* - minimum of 5 positions, collected at 5 second interval and averaged.
   - *All Others* – 90 to 120 positions, collected at 1-2 second interval and averaged.

   Line/Polygon

   - use a 3-5 second interval for walking, force (i.e. wait for) a position at each corner, and use a minimum of 3 positions to define any curve/change in direction.
   - use a 3-5 second interval for road driving, depending on the road type and speed of the vehicle, force (i.e. wait for) positions at each corner and use a minimum of 3 positions to define any curve or change in direction.

Try to map all features in a single area in a single day or on consecutive days.

Attribute Data:

Data Dictionaries

Data dictionaries are designed to simply, efficiently, and without redundancy, describe features (landscape, biological, cultural, or historical). It organizes data into types or 'themes'. It is an inefficient use of time and energy not to use a data dictionary. Set up a menu and picklists in a database and load them into the GPS unit or data collection device prior to going out into the field. Create and use a data dictionary whenever you anticipate collecting attribute data.

Data Conversion to GIS/Data Archiving

Always record the EHE/EPE or maximum PDOP (using 4 satellites) for a file to record in the metadata associated with the resulting GIS data. Without this information the GPS data are considered unreliable and may not be useable for spatial analysis and map production.

Section III

Spatial Data Guidelines

Spatial data, which include GPS generated files, must conform to the following guidelines:

Projection and Coordinate System

All digital geospatial data should reference the coordinate system corresponding to the standard presently in use at the park which, for most parks, will be the correct UTM zone in which the park is found The datum should be the North American Datum of 1983 (NAD83); the ellipsoid should be the Geodetic Reference System 80 (GRS80); and the units of measure should be meters. The contractor should contact the park's GIS Coordinator for specific instructions and/or refer to the contract or cooperative agreement.

Scale and Spatial Resolution (Vector Data)

New data should not exceed 1:24,000. The contractor should contact the park's GIS Coordinator for specific scale and spatial resolution requirements for vector data or they may be specified in the contract or cooperative agreement.

Scale and Spatial Resolution (Image Data-digital or aerial photography)

The contractor should contact the park's GIS Coordinator for specific scale and spatial resolution requirements for image data or they may be specified in the contract or cooperative agreement. For vegetation classification under the NPS/USGS vegetation classification project, the current standard is 1:12,000 color infrared aerial photographs with 60% overlap and 30% sidelap.

Horizontal and Vertical Accuracy

All data should meet or exceed the following National Map Accuracy standards (Source: USGS Fact Sheet 078-96, September 1997).

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> For maps on publication scales larger than 1:20,000, not more than 10 percent of the points tested shall be in error by more than 1/30 inch, measured on the publication scale; for maps on publication scales of 1:20,000 or smaller, 1/50 inch. These limits of accuracy shall apply to positions of well-defined points only. Well-defined points are those that are easily visible or recoverable on the ground, such as the following: monuments or markers, such as benchmarks, property boundary monuments; intersections of roads and railroads; corners of large buildings or structures (or center points of small buildings). In general, what is well-defined will also be determined by what is plottable on the scale of the map within 1/100 inch. Thus, while the intersection of two roads or property lines meeting at right angles would come within a sensible interpretation, identification of the intersection of such lines meeting at an acute angle would not be practicable within 1/100 inch. Similarly, features not identifiable upon the ground within close limits are not to be considered as test points within the limits quoted, even though their

positions may be scaled closely upon the map. This class would cover timber lines and soil boundaries.

Vertical accuracy, as applied to contour maps on all publication scales, shall be such that not more than 10 percent of the elevations tested shall be in error by more than one-half the contour interval. In checking elevations taken from the map, the apparent vertical error may be decreased by assuming a horizontal displacement within the permissible horizontal error for a map of that scale.

The following table provides the allowable horizontal accuracy for some common scales:

Scale	Allowable error (feet)
1:40,000	111
1:24,000	40
1:20,000	33
1:12,000	20
1:9,600	16
1:4,800	8
1:2,400	4
1:1,200	2

Attribute Accuracy

At a minimum, an 80% or greater overall thematic attribute accuracy at the 90% confidence interval is required. The contractor should contact the park's GIS Coordinator for specific attribute accuracy requirements or they may be specified in the contract or cooperative agreement.

Spatial Data Formats

At a minimum, all vector data is to be supplied as an ArcInfo coverage and ArcInfo interchange file, e00, compatible with the current version of ArcInfo for the MS Windows operating system. All raster data is to be supplied as an ArcInfo GRID and ArcInfo interchange file, compatible with the current version of ArcInfo for the MS Windows operating system. All digital imagery, such as scanned aerial photographs, is to be supplied as tagged image file format (tiff) files with the proper header file for geo-referencing purposes. The contractor should contact the park's GIS Coordinator for specific data formats or they may be specified in the contract or cooperative agreement. All data should be delivered on CD ROMs compatible with the MS Windows operating system.

Quality Control

When the contractor has completed 10% of the spatial and attribute data development, the contractor must supply the data to the park and appropriate Regional Technical Support Center (RTSC) for quality control purposes. The data must be delivered in conformance to the Spatial Data Formats requirements. Once the park and RTSC have checked the data and found it acceptable, the contractor may continue data development. Once the contractor has completed the

work, the park and RTSC must accept the spatial data, attribute data, and Federal Geographic Data Committee (FGDC) compliant metadata before the job is considered complete.

Results of tests used to verify all applicable horizontal, vertical and attribute accuracy measurements should also be provided whenever data is provided to the park and RTSC.

Metadata

All digital geospatial data must have FGDC compliant metadata in digital form developed by the data producer. The metadata should be parsed using the metadata parser provided by the FDGC (http://www.fgdc.gov). The metadata should be supplied as ASCII text with a txt extension, hypertext markup language with an html extension and standard general markup language with an sgml extension. The contractor should contact the park's GIS Coordinator or the appropriate RTSC for metedata development instructions.

Regional Technical Support Center for the Philadelphia Support Office
Bill Slocumb
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Raleigh, NC 27695-7106
Email: bill_slocumb@ncsu.edu
Phone: 919-515-3432
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Regional Technical Support Center for the Boston Support Office
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Coastal Institute in Kingston
Kingston, RI 02881
Email: labash@edc.uri.edu
Phone: 401-874-5406
Fax: 401-874-4561

Dataset Catalog Data Entry Form (6/8/00): **Park Code** (4): _____ **Form Set/Page #:** _____

Form Completed by _____**Date:** _____

Section IV

NPS Dataset Catalog Form

Copy and use a separate form set for each data set. Complete all fields. Numbers after field names are the sizes of the fields.

Dataset Title (150):

_____

Citation Info: (Use Citation Form or Author/Origin, Date, Ver./Ed., Series, Issue, Pub. Place, Publisher, Larger Work Cit.):

_____

_____

_____

_____

Project ID (20): _____

Data Originator (Name/Source, Position, Affiliation, Address, Phone, Fax, E-mail):

_____

_____

_____

_____

_____

Dataset Contact (Name/Source, Position, Affiliation, Address, Phone, Fax, E-mail):

_____

_____

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_____

Subject (30): _____ Keywords (100):

_____

_____

_____

Dataset Abstract: (250):

_____

Dataset Catalog Data Entry Form (6/8/00): **Park Code** (4): _____ **Form Set/Page #:** _____

Form Completed by _____**Date:** _____

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Dataset Purpose (250):

_____

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_____

Related Data (# of Citation Forms or Author/Origin, Date, Ver./Ed., Series, Issue, Pub. Place, Publisher, Larger Work Cit.):

_____

_____

_____

_____

Related Document(s) (# of Citation Forms or Author/Origin, Date, Ver./Ed., Series, Issue, Pub. Place, Pub., L. Work Cit.):

_____

_____

_____

_____

Dataset Catalog Data Entry Form (6/8/00): **Park Code** (4): _____ **Form Set/Page #: _____**

Form Completed by _____Date: _____
Single/Begin Date: _____ End Date: _____ Update Frequency (10):

_____

Multiple Dates (Date/Time):

_____

Status (10): New __ Active __ Inactive __ Partial __ Legacy __ Historic __ Other

_____

Progress of Work on Data Set: Planned __ In Work __ Complete __

Location (100):

_____

W. Longitude (Dec. Degrees): _____ N. Latitude (Dec. Degrees):

_____

E. Longitude (Dec. Degrees): _____ S. Latitude (Dec. Degrees):

_____

UTM Zone (Optional): _____ W. Easting (Opt.): _____ N. Northing (Opt.):

_____

E. Easting (Opt.): _____ S. Northing (Opt.):

_____

Coverage (6): In __ Out __ In&Out __ Park Clip __ Park Area __ NPS-wide __ Region-wide __ Other

_____

Data Type (6): GEORAS __ GEOVEC __ GEODB __ DIGRAS __ DIGVEC __ DIGDB __ ANAORG __ ANAUNO __

Data Type 2 (20): Polygon __ Line __ Point __ DEM __ Raster __ DOQ __ Landsat __ Imagery __ Spreadsheet __

Database __ Document __ Delimited text __ Tagged text __ ASCII text __ Other

_____

Coordinate System: UTM __ Lat/Lon __ State Plane __ Other _____ Datum: NAD27 __ NAD83 __

Source/Attribute?, Table/Layer Name (50 each), Optional Table Page(s)?, Scale Denominator, Cit.?

Dataset Catalog Data Entry Form (6/8/00): **Park Code** (4): _____ **Form Set/Page #: _____**

Form Completed by _____Date: _____

Source or Attribute, _____ , ___ ,

_____ , ___

Source or Attribute, _____ , ___ ,

_____ , ___

Source or Attribute, _____ , ___ ,

_____ , ___

Source(s) Contribution (Also use Citation Form and attach pages as needed, 250):

_____

_____

_____

Data Format (80): Paper __ dBASE __ Access __ Lotus __ Excel __ WordPerfect __ Word __

ASCII __ or

Other (list):

_____

Conversion Needed? Yes or No File Size (50):

_____

File Location (100):

_____

Data at Park? Yes or No Distribution Costs: None __ Other

_____

Distribution (100):

_____

Online Link URL (150):

_____

Quality (15): Unknown __ *Not* Ver./Val.(?) __ Verified __ Validated __ Metadata __

Quality Report: (250):

_____

_____

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_____

Dataset Catalog Data Entry Form (6/8/00): **Park Code** (4): _____ **Form Set/Page #: _____**

Form Completed by _____Date: _____

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_____

Metadata Status: None __ Planned __ In Work __ Complete __ Metadata Priority: High __ Medium __ Low __

Metadata Standard: FGDC __ NPS Dataset Catalog __ None __ Other

_____

Metadata Link URL (150):

_____

Metadata Contact (Name/Source, Position, Affiliation, Address, Phone, Fax, E-mail):

_____

_____

_____

_____

_____

Is the Dataset Sensitive? Yes or No If So, How is the Dataset Sensitive? Archeology __ Cave __ Classified __ Law Enforcement __ Paleontology __ T&E Species __ Other

_____

Classified Data Type: N/A __ Unclassified __ Sensitive __ Restricted __ Confidential __ Secret __ Top Secret __

Access Restrictions (12): Public __ Fed. Only __ NPS Only __ Park Only __ Contact Only __

Comments: (250):

_____

_____

_____

_____

_____

Dataset Catalog Data Entry Form (6/8/00): **Park Code** (4): _____ **Form Set/Page #:** _____

Form Completed by _____**Date:** _____

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Dataset Catalog Data Entry Form (6/8/00): **Park Code** (4): _____ **Form Set/Page #: _____**

Form Completed by _____Date: _____

Citation Information: Dataset __ Source __ Related Doc. __ Related Data __ L. Work __
Copy form and use for citations. Complete applicable fields. Numbers after field names are the sizes of fields.

Origin/Author(150):

_____

_____

_____

Publication Date: _____ Publication Time (optional):

_____

Title (150):

_____

_____

_____

Edition/Version (50):

_____

Geoform (pub. format) (50):

_____

Series (50):

_____

Issue (50):

_____

Publication Place (50):

_____

Publisher (100):

_____

_____

_____

Other Citation Details (100):

_____

Dataset Catalog Data Entry Form (6/8/00): **Park Code** (4): _____ **Form Set/Page #:** _____

Form Completed by _____**Date:** _____

_____

_____

Online Linkage:

_____

Larger Work Citation (list below or on another form):

_____

Citation Information: Dataset __ Source __ Related Doc. __ Related Data __ L. Work __

Origin/Author(150):

_____

_____

_____

Publication Date: _____ Publication Time (optional):

_____

Title (150):

_____

_____

_____

Edition/Version (50):

_____

Geoform (pub. format) (50):

_____

Series (50):

_____

Issue (50):

_____

Publication Place (50):

_____

Publisher (100):

_____

_____

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Dataset Catalog Data Entry Form (6/8/00): **Park Code** (4): _____ **Form Set/Page #: _____**

Form Completed by _____Date: _____

Other Citation Details (100):

_____

_____

_____

Online Linkage:

_____

Dataset Catalog Data Entry Form (6/8/00): **Park Code** (4): _____ **Form Set/Page #:** _____

Form Completed by _____**Date:** _____

Data Dictionary Form: Theme, Table Structure, and Field Definitions
Copy form and use for table/theme descriptions. Complete applicable fields. Numbers after field names are the sizes of fields.

Spatial Theme (if applicable, 50):

_____

Spatial Theme Description (if applicable, 250):

_____

_____

_____

_____

_____

_____

_____

_____

Table Name (50):

_____

Table Filename (8 characters or less is best, 50):

_____

Table Description (250):

_____

_____

_____

_____

_____

_____

_____

_____

Table Format (text, dBase IV, MS Access, etc., 50):

_____

Dataset Catalog Data Entry Form (6/8/00): **Park Code** (4): _____ **Form Set/Page #:** _____

Form Completed by _____ **Date:** _____

Number of Fields (50):

_____

Field Definitions (continue on back or other page(s) as needed):

Field Name (10 chars. or less is best)	Field Type (text, etc.)	Size	Description
_____			
_____			
_____			
_____			
_____			
_____			
_____			
_____			
_____			
_____			
_____			
_____			

Field Value or Pick List and Brief Definitions (if applicable, continue on back or other page(s) as needed):

Field Name	Field Value	Value Definition
_____		
_____		
_____		

Dataset Catalog Data Entry Form (6/8/00): **Park Code** (4): _____ **Form Set/Page #:** _____

Form Completed by _____**Date:** _____

_____

_____

_____

_____

Section V
METADATA QUESTIONNAIRE

Please fill out all four sections completely for each data layer you are submitting.

SECTION 1: This section gathers contact information about the person completing this form, in case parks needs to clarify some of the information in the questionnaire.

Date you completed this form: _____
For person completing this form:

Name: _____

Address: _____

_____

Phone Number: _____

E-Mail: _____

SECTION 2: Questions in this section gather information used to identify and describe the contents of your data layer.

1. NAME OF THE DATA LAYER:
_____

2. For the person who created the data layer (if different from the person completing this form):

Name: _____

Address: _____

_____

Phone Number: _____

E-Mail: _____

3. What does the data layer contain?

POINTS _____ which represent
_____

LINES _____ which represent
_____

POLYGONS/AREAS_____ which represent _____

ANNOTATION/TEXT_____ which describes _____

4. For what purpose was this data layer created (please describe):

5. What is the date of the last revision, change or update to this data layer?
(MM/DD/YYYY):_____

6. When did you actually collect this information and/or map these locations?
DATE or range of dates:
(MM/DD/YYYY)_____

7. What is the status of this data layer (pick one):
COMPLETE _____

IN PROGRESS, MORE DATA TO BE ADDED _____
When do you expect to add additional data?

INCOMPLETE, NO ADDITIONAL WORK PLANNED_____
Please describe what is lacking:

8. Is the data layer part of a larger work or related to a particular study? YES_____ NO_____
If YES, give a complete reference for that work or study:

9. Does the data layer contain information related to
a) Rare, threatened, or endangered plants or animals?
YES _____ NO _____
IF YES, please describe briefly:

b) Archeological or cultural resources?
YES _____ NO_____
IF YES, please describe briefly:

10. Please list some keywords describing the contents and/or purpose of this data layer:

11. Which of the following geographic areas would include all of the features depicted in your data
layer? (please pick the smallest area that would work):
Mount Desert Island (MDI) only_____
MDI and surrounding islands (Bar, Porcupines, Cranberries, Baker, Bartlett) _____
Schoodic Peninsula (SCH) only _____
Isle au Haut (IAH) only _____
MDI and SCH _____
MDI and IAH _____
MDI, IAH, and SCH _____
Penobscot Bay shipping channel to Hancock/Washington County line _____
Other (please describe!): _____

SECTION 3: Questions in this section will tell future users of this data layer what information is contained in the database associated with each feature. Examples are given in the shaded part of the table.

Please complete the following table listing all database fields (attributes) you added. You do not need to list ArcInfo's default fields such as AREA, LENGTH, COVERNAME#, COVERNAME-ID, RPOLY#, LPOLY#, etc. However, if you calculated a field such as ACRES (which contains the area of a polygon in different units) or MILES (length of a line in miles), you must describe it.

Please copy additional pages of the table if you run out of room or add rows if you are completing this form digitally.

EXAMPLES:

ITEM NAME (use ITEMS command in ARC or TABLES)	DATA BASE STRUCTURE (use ITEMS command in ARC or TABLES)	DEFINITION/DESCRIP-TION OF THE ATTRIBUTE	SOURCE OF THE DEFINIT-ION/ DESCRIP-TION	UNITS OF MEASURE (if applicable)	SET OF POSSIBLE VALUES	OTHER CITATION OR REFERENCE WITH INFORMATION ABOUT THE ATTRIBUTE OR ATTRIBUTE VALUES

TYPE	2 2 I	TYPE describes what kind of structure is represented by the point using a numeric code. 1=single family residence, 2=multiple family residence, 3=commercial, 4=municipal, 5=agricultural, 6=scientific research, 10=industrial	K.Anderson (if I made up the classification) OR "Structural Definition Codes for Municipalities," 199X, Maine Department of Something or Other, Report No. XXXX-0061.	Not Applicable	Minimum value of 1, maximum value of 10	Not applicable
TOWN NAME	20 20 C	The name of the town represented by the polygon.	Names taken from the 7.5min USGS topo quadrangle maps.	Not applicable	Bar Harbor Mount Desert Southwest Harbor Tremont	Not applicable
DBH	6 6 N 2	Diameter at breast height of the tree represented by the point.	K.Anderson	Inches	Minimum value 0.01, maximum value 1000.00	Doe, J., 1964, Standard Forestry Measurements, Greenhill Publishing House, NY, pp.121-135.
ADDRESS	40 40 C	Mailing address of the house indicated.	US Postal Service	Not applicable	Too varied to define.	Not applicable.

DATABASE ATTRIBUTE INFORMATION

Please describe each attribute in the PAT (polygon/point attribute table) and AAT (arc attribute table) that is not an ArcInfo default attribute. The idea is to describe the attributes so someone *completely* unfamiliar with them could understand and use them!

.

ITEM NAME	DATABASE STRUCTURE (from ARC or TABLES)	DEFINITION/DESCRIPTION OF THE ATTRIBUTE	SOURCE OF THE DEFINITION/ DESCRIPTION	UNITS OF MEASURE (if applicable)	SET OF POSSIBLE VALUES	OTHER CITATION OR REFERENCE WITH INFORMATION ABOUT THE ATTRIBUTE OR ATTRIBUTE VALUES

SECTION 4: Questions in this section will help future users understand how your spatial data was created, evaluate its quality and accuracy, and determine if it will be useful to them. Shaded text denotes examples.

1. Is this data layer, in accordance with Acadia National Park GIS Standards, in Universal Transverse Mercator (UTM) coordinates and projected using the NAD83 datum?
   YES _____ NO _____
   IF NO, what coordinate system and datum is used and why is it not to standard?

2. Describe any rules you used to create the data set. For instance, how did you decide what to include/exclude? Did you use a minimum mapping unit? Examples:
   -Only wetlands greater than or equal to a half-acre (0.5) were mapped.
   -Only the sample sites at which we found mercury were included.
   -"Pond" means any open water body less than 1 acre, "Lake means any open water body greater than or equal to 1 acre.
   -Includes only currently maintained park trails; no "historic" or "abandoned" trails, no "social" trails, no trails outside park boundaries.

3. Please list your estimate of the horizontal accuracy of the positional data and how you arrived at that estimate. Examples:
   *estimated accuracy is +/- 1-3 meters based on the published accuracy of the GPS unit we used to collect the positional information (*you can use this one if you mapped with GPS using the park units, standard settings, and differentially corrected your field data).*
   *estimated accuracy of +/- 30 meters based on gut feeling
   *within National Map Accuracy Standards for 1:24000 data
   *+/-1 foot according to FruFru Correlation Test
   *digitized with an RMS error of .003 or less

4. PLEASE FILL OUT THE FOLLOWING TWO TABLES ACCORDING TO THESE DIRECTIONS:

   The Source Information Table asks you to list and describe all the sources of information (including other data layers) you used to create your data layer. The Processes & Operations Table asks you to describe the processing steps you took to combine the sources into your data layer. *These two tables are related*—each source should be "used" in a process. Sometimes a processing step produces an intermediate source that should be described in the source table. An example is provided in the grey-shaded boxes of the two tables. Please include as much detail as possible including software version numbers, critical settings, tolerances, etc. *You may find it helpful to fill these tables out as you are creating your data layer.*

   Please copy additional pages or add additional rows if you need more space. Remember, the idea is to describe what you did well enough that someone else could understand, and perhaps replicate, what you did!

SOURCE INFORMATION TABLE

Please list and describe each source of information or data layer used in the creation of the data layer you are describing.

Boxes highlighted in grey are examples related to the examples in the Processes & Operations Table.

SOURCE NAME	NARRATIVE DESCRIPTION OF SOURCE AND THE INFORMATION IT CONTAINS AND CONTRIBUTES	ORIGINATOR OR CREATOR OF THE SOURCE DATA	DATE OF SOURCE MATERIAL	SCALE OF SOURCE MATERIAL	SOURCE MEDIA (digital, paper, mylar, etc.)	IS THIS SOURCE PART OF or RELATED TO A LARGER WORK? IF SO, GIVE CITATION
GPSDATA	Rare plant locations depicted by points collected with a Trimble ProXL GPS set to following critical settings: PDOPMask=6, SNRMask=6, Manual3Dmode, LoggingInterval=5sec, MinimumPositions=36, ElevationMask=15. Rated accuracy of differentially corrected files with this GPS is +/-3-5 meters. GPS files were differentially corrected using base station files from the University of Maine at Orono (Louis Morin, sysop) using Trimble's Pathfinder Office ver2.11.	K.Anderson operated the GPS. L.Gregory assisted in locating the plants.	GPS field work conducted May to Sept. 1999	Not applicable	digital	Greene, Craig. 1990. Rare plants of Acadia National Park.
PLANTLOC	Arc/Info point coverage, generated from GPSDATA, showing the location of rare plants. Attributes include scientific name and ID number.	K.Anderson and L. Gregory	Sept. 1999	Not applicable	Digital	Not applicable
SOILS	Arc/Info polygon coverage of soil types for Hancock County. SSURGO soils data from NRCS.	NRCS (Natural Resource Conservation Service)	1991	1:24000	Digital	Not applicable

PROCESSES & OPERATIONS TABLE

Please list and describe the major processing steps you took in the creation of this data layer.

Boxes highlighted in grey are examples related to the examples in the Source Information Table

You do NOT need to document every CLEAN or BUILD in complex editing sessions.

SOURCES USED (must reference a source listed in the SOURCE TABLE)	PROCESS DESCRIPTION (Describe what was done and how you did it. Include tolerances used, software versions, etc.	PROCESS DATE	SOURCE PRODUCED	NAME AND CONTACT INFORMATION for the party responsible for the processing step.
GPSDATA	Points exported from Pathfinder Office ver.2.11 to ArcInfo generate format. In ArcInfo (ver7.2.1), GENERATE was used to create a GIS data layer of the points. The data layer was BUILDed for points. About 10 of the points were checked to ensure that the attribute information entered in the field was still associated with the correct point; all the attributes checked were correct.	9/15/1999	PLANTLOC	Karen Anderson Geographer (GIS Specialist) Acadia National Park P.O. Box 177 Bar Harbor, ME 04609 207-288-5463 (voice) karen_b._anderson@nps.gov
PLANTLOC SOILS	The following ArcInfo command was executed: IDENTITY PLANTLOC SOILS RPSOIL POINT # JOIN All attributes from SOILS except FLD_SYM were DROPITEMed from RPSOIL's point attribute table (PAT). This produced the data layer being described (RPSOIL)—an ArcInfo point cover with attributes about the rare plant and the soil type in which it is likely to be growing.	9/22/1999	RPSOIL	SAME AS ABOVE

Section VI

Voucher Specimen Collection

The final decision on the collection of voucher specimens will be left up to the discretion of the park, but the collections policy for the Northeast Region I&M Program is as follows. Cooperators may collect whole specimen vouchers on amphibians, snakes, mammals, fish and plants only if:

1. Identification of a species is in question. This may mean that certain taxa, such as fish, may require more intensive vouchering than other taxa.

2. Or if a particular species has not yet been collected in a park. A list of existing voucher specimens will be available for each park, and cooperators are required to review this list prior to fieldwork.

Plants and animals that may not be whole-specimen vouchered include birds, turtles, large mammals (unless found as roadkill) and common plant species. If vouchering is necessary for any of these because no voucher exists for a particular park, photo documentation is required.

Photo Documentation

The Northeast Region I&M Program is requiring all cooperators to use non-invasive methods of vouchering, such as color photography, or other signs or remains(e.g. hair samples, scat or tracks) whenever possible. Photographs of a species will be considered a voucher and will be referenced in the NPS NPSpecies database. Photographs taken to provide documentation of a species must be taken with a macro or close-up lens. Photographs should show features used for identification of the species and be to proper (Sara – what is “proper”?)scale. It may be necessary to take more than one photograph of an individual from different angles. All photographs must be submitted with the pertinent raw data. All slides and photographs must be kept in appropriate protective sleeves.

Whole Specimens

Collectors will be responsible for cataloging specimen/field notes for items deposited into non-NPS repositories. Mandatory fields that must be provided to NPS curatorial staff can be found at the end of this section??????. The more information a collector can provide, the more useful the specimen/field notes will be to future managers and researchers.

Voucher preparation will be the responsibility of the cooperatorwho must have a valid park permit to collect specimens.All vouchers taken on NPS lands, regardless of their repository, will be the property of the NPS. Cooperators will be responsible for accessioning voucher specimens into ANCS+.

Voucher specimen collection must follow the guidelines defined by the Components of British Columbia’s Biodiversity (CBCB) manual #4, Collection and Preparation of Voucher Specimens and any guidelines a cooperating institution’s Animal, Care and Use Committee has developed.

Mammalian Collection

In order to minimize disturbance on mammalian populations in the parks, photo vouchering and collecting animals where death resulted from either trap mortality or roadkill will be priority over euthanizing individuals. Vouchering methods are described in Table 1 for some mammalian groups that may be found in northeastern parks. Guidelines found in the *Live Animal Capture and Handling Guidelines*, manual no.3, will be followed for proper capture, handling and euthanasia procedures. Guidelines and references for the preservation of voucher specimens can be found in *Measuring and Monitoring Biological Diversity, Standard Methods for Mammals* (Wilson et al, 1996).

Table 1. Vouchering methods for some mammalian groups.

Taxa	Vouchering Method
Bats	wing punch or whole specimens for easily misidentified species when capture is part of the inventory protocol. Morphometric data, photographs, digital sonograms or cassette tapes with reference calls should also be collected as evidence of rare or endangered bats.
Small Mammals - Shrews, Voles, Mice, Rats and Lemming	3 of each species: 1 of each sex (if sexes are distinguishable) and the 3rd a juvenile (of either sex) is preferred, especially if there is much difference from the adults.
Moles	whole specimens only if trap mortalities occur.
Medium-sized mammals	whole specimens not necessary, photo vouchers or specimen voucher for trap mortalities and roadkill, collection of other sign when possible (tracks, hair, scat).
Large mammals	photo vouchers, collection of other sign when possible (tracks, hair, scat)

Fish Collection

Digital photographs can be an accurate and economical method for vouchering fish specimens. Please follow the guidelines for vouchering fish specimens by Dr. Jay Stauffer and Timothy Stecko from Penn State University. (Please request this document from either Sara Stevens of Elizabeth Johnson). Although it may not be possible to identify all fish specimens from digital photographs taken in the field, these guidelines will be useful for most fish collected. Immature fishes of all species and some of the minnow species, particularly in the genus *Notropis*, need to be collected and properly preserved.

Amphibian and Reptile Collection

For identification purposes, most species of amphibians and reptiles can be adequately confirmed from photographs. Collecting whole specimens of amphibians and snakes will only be allowed as stated above, if a whole specimen does not exist for a park. Turtles may only be vouchered through photo documentation.

Vascular Plant Collection

Species that are common to the park or have already been vouchered should not be collected. Because any collection of specimens impacts a population, it is especially important when collecting rare species to weigh the destructiveness of collection against the amount of information gained. Federal and state Threatened and Endangered plants will not be collected in populations of less than 50 individuals (Elzinga et al, 1998). It is incumbent upon the cooperator to know which taxa are locally or nationally rare or protected, and to be familiar with all federal and state legal procedures for collecting. In small populations, only small portions of plants will be collected if necessary. Cooperators are advised not collect indiscriminately, even in large populations, and to collect only the minimum amount of plant material necessary. (The Plant Conservation Round Table, 1986).

Voucher specimens will be collected during inventory in accordance with collections policies outlined in *NPS Management Policies* ("Museum Objects and Library Materials" and "Preservation of Data and Collections and Protection of Research Potential") and NPS-77, *Natural Resource Management Guideline*. Obtaining the necessary permits for collecting will be the responsibility of the cooperator/contractor and the parks.

For all vouchered specimens, please fill in the information below and submit information as an Appendix with your final report. If you have more than one specimen with the same genus/species collected at the same site, only fill in one sheet). This information will enable the park to fully document your research in the National Park Service's National Catalog.

BIOLOGY SPECIMENS:

- Collection Permit number: _____
- Fixative or killing agent used: _____
- Preservative agent used: _____
- Number of specimens: _____
- Order: _____, Genus _____ , Species: _____
- (Sara—what's this???) UTM, Latitude/ Longitude, or elevation: _____
- Collection Site: _____

- Principle Investigator: _____
- Specimen Identified (classified) by: _____
- Collection Date: _____

Section VII

Report Guidelines

Progress Report Format Guidelines

- As requested, submit progress reports double-sided and single-spaced on 8 1/2" x 11" white bond paper and/or in MS Word (most recent version) files as an email attachment or on a Windows formatted 3.5" diskette.
- Use Times New Roman 12 pt font.
- Commence pagination on the first page of text as a footer and centered.
- Begin paragraphs left justified without indentation on the first line and separate paragraphs from each other double-spaced.
- Use title case (i.e. first letter of all words capitalized except articles, prepositions, and conjunctions) for all section headings.
- Use the following style for section headings:

First Order Header [center]
Second Order Header [flush left]
<u>Third Order Header</u> [flush left, underlined]
Fourth Order Header: [flush left, colon, two spaces, continue with text].
Fifth Order Header [flush left, italicize]

- Submit the specified number of copies (usually five) to the designated NPS Key Official on or before the date(s) identified in the research permit, contract, or agreement.
- Depending on the scope of the project, progress reports are usually required quarterly, semiannually, or annually.

Progress Report Content Guidelines

The progress report is a brief, informal, narrative statement of the status of all work accomplished during the period specified, and a summary of work to be performed during the following period. Progress reports should include:

a) a title page containing the following information: the words "Progress Report"; title of project; investigator name(s), affiliation, and address; NPS contract, agreement, or purchase order number; date of submission; and time period covered by report,
b) a quantitative description of overall progress and significant findings to date,
c) an indication of any current problems that may impede performance and proposed corrective actions, and
d) a brief discussion of the work to be performed during the next reporting period.

Draft final and final report format and content guidelines

At the completion of a research study, the investigator must submit a draft final report that documents the study methods, results, and conclusions of the entire project as required by the contract. The specified number of copies (usually five to ten) must be submitted to the designated

NPS Key Official on or before the date identified in the contract. The report should be written to an "audience" of park managers who may lack training or exposure to the particular discipline. The report may also be distributed to other government agencies, the scientific community, politicians, reporters, and the public. Keep the main body of the report short and concise. This may be accomplished through the use of appendices for extensive literature reviews, detailed explanations of the research design and methods, supplementary data, information which does not directly address the research objectives specified by park managers, and highly technical material (equations, statistical analyses, and testing). Write in a non-technical jargon-free style, avoiding or clearly explaining any scientific terms or terms unique to a specific discipline. Your goal is to clearly and concisely convey study results and management implications to a nonscientist. It is very important for purposes of proper review that both the draft and final reports adhere to the format and content guidelines presented in this manual.

Upon submission of the draft final report, the designated NPS Key Official will review the manuscript and seek additional management and scientific review comments from appropriate NPS regional and park personnel and peer members of the scientific community to ensure technical quality and accuracy of information. Review comments and recommended changes will then be returned to the author(s) for consideration and preparation of the final report.

All appropriate comments from draft final report reviews should be addressed and incorporated during the preparation of the final report. Before duplication, a copy of the final report must be sent to the designated NPS Key Official for final approval of review modifications and format. Upon approval, a letter quality original, reproducible copy of the final report and the specified number of copies (usually ten to fifteen) must be submitted to the designated NPS Key Official on or before the date identified in the research permit, contract, or agreement. A diskette, containing the report in MS Word 97 must be submitted along with the paper copies.

The final report may be printed and distributed as part of an NPS Technical or Natural Resources Report series. Reports printed in these series are not considered formal publications, and the information may be subsequently submitted by authors to peer reviewed journals. The designated NPS Key Official will notify the author of the decision to print the final report in one of the series and will assign the series name and number to be included on the title page. Preprinted front and back covers will be provided for final duplication and distribution.

Draft Final and Final Report Format Guidelines

- Submit all reports double-sided on 8 1/2” x 11” white bond paper and in MS Word (most recent version) files on a Windows formatted 3.5” diskette.
- Start all first order sections on a new right hand page.
- Use Times New Roman 12 pt font throughout and avoid bolding text.
- Double-space draft final reports and single-space final reports.
- Allow 1" on all margins.
- Left-justify paragraphs without indentation on the first line and separate paragraphs from each other double-spaced.
- Do not hyphenate whole words at the end of a line, instead use an unjustified right margin.
- Number all pages sequentially at the bottom of the page, centered.

- The initial sections (Table of Contents, List(s) of Figures, Tables, and/or Appendices, Summary, and Acknowledgments) should be numbered sequentially using lower case Roman numerals (i, ii, iii, ...) with numbering beginning with, but not appearing on, the Title Page.
- The main body of the report (beginning with the Introduction) should be numbered sequentially using Arabic numerals (1, 2, 3,...).
- Blank pages are counted but not numbered.

- Use title case (i.e. first letter of all words capitalized except articles, prepositions and conjunctions) for all section headings.
- Use the following style for section headings:

First Order Header [center]
Second Order Header [flush left]
<u>Third Order Header</u> [flush left, underline]
Fourth Order Header: [flush left, colon, two spaces, continue with text]
Fifth Order Header [flush left, italicize]

Table of Contents

- Include only first and second order section headings in the Table of Contents. Include all first and second order section headings that follow the Table of Contents (i.e. beginning with and including headings for lists of figures, tables, and/or appendices).
- Use title case on all Table of Contents entries.
- Double-space entries.
- Indent second order section headings from first order section headings 7 spaces.
- A space followed by a line of dots followed by a space should proceed from the last word of each entry to a right justified page number.
- Allow page numbers to "stand alone" on the right side of the page by spreading longer entries to additional lines, making sure that each line of the entry is indented to the same starting point as the first word of the entry.
- Repeat the heading (i.e. Table of Contents) followed by "continued" in parentheses at the top and centered for each additional page of the Table of Contents.

List of Figures, List of Tables, and List of Appendices

- Each of these lists must begin on a new right hand page.
- Double-space entries.
- Begin entries with a capitalized label followed by a space then a number (for figures and tables) or capitalized letter (for appendices) then a period then a double space then a title (e.g. "Figure 1. Map of survey area", "Table 21. Estimated larvae in survey area", or "Appendix G. Checklist of butterfly species").
- If there is only one appendix, do not include a List of Appendices page; list it as the last entry in the Table of Contents as "Appendix" with no letter afterward.
- A space followed by a line of dots followed by a space should proceed from the last word of each entry to a right justified page number.

- Allow page numbers to "stand alone" on the right side of the page by spreading longer entries to additional lines, making sure that each line of the entry is indented to the same starting point as the first word of the entry.
- Use sentence case (i.e. capitalize only the first letter of the first word and any proper nouns) for titles.
- Repeat the heading (e.g. List of Figures) followed by "continued" in parentheses at the top and centered for each additional page of the list.
- Consult Tables. 1, 2, and 3 for example lists.

Citing Literature

- Follow the author and year system for citing literature references in the text. If you wish to mention the author in your discussion say, for example, "Wakeley (1954) reported that...". Otherwise, place the author and year within or at the end of your statement, (Wakeley 1954).
- Semicolons separate citations of works by different authors in one set of parentheses (Wakeley 1954; McManus 1957).
- Commas separate several cited works by the same author (Hackett 1970, 1972a, 1972b).
- List all references in the "Literature Cited" section of the report using the Council of Biology Editors (CBE) bibliographic style as outlined in Table 4.

Table 1. Example list of figures

List of Figures

Table 2. Example list of tables

List of Tables

Table 3. Example list of appendices

List of Appendices

Table 4. Literature cited section format

Journal Article

Format

First author Surname, Forename initial Middle initial(s)., and Second author Forename initial Middle initial(s). Surname. Publication date. Article title. Journal title. Volume number(Issue number):page number-page number.

Example

Kinbote, C. V., and D. N. Haze 1948. A new species of Cyclarus Nabokov. The Entomologist. 81(1027):273-280.

Book

Format

First author/editor Surname, Forename initial Middle initial(s)., and Second author/editor Forename initial Middle initial(s). Surname, editors [if applicable]. Publication date. Title of book. Edition number. Publisher, City of Publication, State/Country of Publication. number of pages pp.

Example

Knight, S. V., and V. N. Darkbloom, editors. 1998. Butterfly identification in our National Parks. Second edition. Blackwell Scientific Publications, Ithaca, New York. 512 pp.

Report

Format

First author Surname, Forename initial Middle initial(s). and Second author Forename initial Middle initial(s). Surname. Publication date. Title of report. Report Identification Number. City of Publication, State/Country of Publication. number of pages pp.

Example

Quilty, C. V., and A. N. Vokoban. 1961. A study of Lepidoptera at Shenandoah National Park. National Park Service Technical Report NPS/SHEN/NRTR-91/016. Luray, Virginia. 161 pp.

Table 4. Literature cited section format (continued)

Chapter in Book or Paper in Conference Proceedings

Format

First author Surname, Forename initial Middle initial(s)., and Second author Forename initial Middle initial(s). Surname. Publication date. Title of chapter or paper. Pages page number-page number in First editor Forename initial Middle initial(s). Surname and Second editor Forename initial Middle initial(s). Surname, editors. Title of book or conference proceedings. Publisher, City of Publication, State/Country of Publication.

Examples

Chapter in Book:

Pnin, P. V., and H. N. Humbert. 1999. Yesterday's caterpillar: A re-examination of Lepidoptera morphology at Hopewell Furnace National Historic Site. Pages 131-313 in .S. V. Odon, and K. N. Krug, editors. Insect Studies in National Parks of the Eastern United States. University Park, Pennsylvania

Paper in Conference Proceedings:

Pnin, P. V., and H. N. Humbert. 1999. Yesterday's caterpillar: A re-examination of Lepidoptera morphology at Hopewell Furnace National Historic Site. Pages 131-313 in .S. V. Odon, and K. N. Krug, editors. Insect Studies 1998-1999. American Society of Entomologists. University Park, Pennsylvania

Thesis

Format

Author Surname, Forename initial Middle initial(s). Date of thesis. Title of thesis. Type of thesis. University. number of pages pp.

Example

Zembla, V. N. 1997. A comparative ecological study of Madeleinea mashenka and Madeleinea lolita in Northeastern National Parks. M. S. thesis, Cornell University. 242 pp.

Figures and Tables

- Figures and tables should have brief descriptive titles.
- Numbers and titles for figures should be below the figure and left justified.
- Numbers and titles for tables should be above the table and left justified.
- Explanatory information and keys to symbols should be placed in the legend to the figure or as a footnote at the bottom of the table.
- The title, heading, legend, and footnotes must contain all the information the reader needs to
- understand a table or figure without referring to the text.
- All figures (including maps and photographs) and tables should be in digital format as part of the final document. If line drawings and artwork are necessary, they must be in high-contrast black and white and of a professional reproducible quality.
- Figures and tables should not be placed on a page with text but should be on their own
- numbered page immediately following the page (double-sided) in which they are referenced.
- Use sentence case for all figure and table titles.
- Figures and tables, respectively, are numbered sequentially with Arabic numerals in the order of their presentation in the text
- Every table and figure must be cited in the text (e.g. "(Table 1)" or "...in Figs. 2 and 3").
- For figures and tables which are more than one page, repeat the figure or table number and title
- followed by "continued" in parentheses, for each additional page.

Appendices

- Each appendix must begin on a new right hand page
- Appendices are labeled sequentially with capitalized letters (e.g. "Appendix A", "Appendix B", etc.) followed by a brief concise title in sentence case at the top of the page and centered.
- A single appendix is labeled "Appendix."
- If possible, the title should appear on the same page with the appendix material; if not, the title can be placed centered on the top of the preceding right hand page.
- For appendices that are more than one page, repeat the title at the top and centered, followed by "continued" in parentheses, for each additional page.

Measurement Units

- All measurement units must be metric.
- Include U.S. equivalent measurements parenthetically.
- Use abbreviated standard units of measure when with a numeral, whereas, units of measure are to be spelled out if no quantity is given (e.g. "10 m" or "...meters").
- Retain only the final unit of measure in a series (e.g. 10 to 15 kg).
- Use a "/" for ratios with numbers (e.g. 10 deer/ha) but use "per" for ratios without numbers (e.g. deer per hectare).

Numbers

- Numbers from one through nine are written out; numbers above nine are expressed as numerals except when first word of sentence. Ordinal numbers (e.g. second, 23rd) are treated the same.

- Physical measurements (length, width, distance, area, volume, decimals, percentages, degrees, symbols, latitude/longitude, fractions over one) and time (days, years) are always expressed as numerals.

Taxon Names

- The NPS has adopted ITIS (Integrated Taxonomic Information System) as its standard for taxonomy and nomenclature, and all scientific names should follow that standard. See http://www.itis.usda.gov/plantproj/itis/index.html
- Use common species names of plants and animals initially followed with scientific names parenthetically; thereafter, only the common name is necessary.
- If a large number of species are referred to in the text, a reference list of common and scientific names must be included as an appendix.

Copyrighting

Authors are responsible for obtaining written permission for use of any copyrighted figures, tables, graphs, and information.

Errors

Authors are responsible for conducting an editorial review of the draft report to ensure: clarity; proper grammar, spelling, and punctuation; accuracy and completeness of all numbers, tables, figures, and references; and adherence to these format and content guidelines.

Draft Final and Final Report Content Guidelines

The following list provides a general outline of first order headings for all draft and final reports. Each first order heading must begin on a new right hand page. These headings may vary or others may be added, but their order should approximate the following:

- Title Page [see Table 5 for example]
- Table of Contents
- List of Figures [if applicable; see Table 1 for example list]
- List of Tables [if applicable; see Table 2 for example list]
- List of Appendices [if applicable; see Table 3 for example list]
- Abstract and Key Words
- Summary
- Acknowledgments [optional]
- Introduction
- Study Area
- Methods
- Results
- Discussion
- Conclusions
- Literature Cited [see Table 4 for example formats]
- Appendices [if applicable]

Title Page

The following information, duplicating as close as possible the title page format shown in Figure 5, must appear on the title page.

- Title [use title case and bold]
- Author(s) [first name, middle initial(s), surname; no professional titles or academic degrees; avoid the use of "by"]
- NPS Report Identification Code and Number [if assigned by designated NPS Key Official]
- Author's Organization Mailing Address
- Month/Year
- Month/Year of Update(s) [if applicable]
- Contract or Agreement Number [include Supplemental Agreement Number, if applicable]
- Appropriate Regional or Support Office Mailing Address

Table of Contents

Include a table of contents listing lists of figures, tables and /or appendices, and all first and second order section headings.

List(s) of Figures, Tables, and/or Appendices

Include a separate list for each set of figures, tables, and/or appendices that are included in the report.

Abstract and Key Words

Provide a brief abstract (a paragraph or two in length) which concisely describes or gives a brief overview of the research (i.e. where/when/how the research was conducted, results, and conclusions)

Also include a list of two to four keywords beneath the abstract.

The abstract and keywords must be together on no more than one page.

Summary

This "stand alone" section should summarize the prominent facts discussed in the report and the conclusions reached in relation to research objectives. It should be as brief as possible, yet cover the subject in a clearly written, non-technical style so that, on its own, this section tells the reader what the project was about and what conclusions were made. This section is often removed from the report and used by the park Superintendent to inform legislators, public individuals and organizations, and NPS park, regional, and Washington Office staff of the completion and results of the study.

Acknowledgments (optional)

Briefly acknowledge those who directly helped with research or writing. Acknowledgments of typists, illustrators, editors, and referees may be included, but generally are discouraged. Use only forename initials with surname(s) and do not include professional titles or academic degrees.

Introduction

The introduction should include the hypotheses and purpose of the investigation, research objectives, conditions under which the study was conducted, the general plan of treatment of the subject, and summary of previous work accomplished (literature review) that relates to the project.

Study Area

Provide a concise narrative description and justification of the study area(s) for the research. Include a detailed map of the study area(s) for further clarity.

Methods

Present a detailed explanation of the methods, materials, and analytical techniques that were used in the field, laboratory, and office during the study. Describe how, when, where, and by whom the data were acquired for the investigation. The methods should be documented so that the investigation could be exactly repeated, if necessary. Be sure to include how data were analyzed and what statistical tests were employed. Describe the process used for determining whether the data met the data quality objectives and, if not, what corrective actions were taken. Detailed information about QA/QC procedures for data collection, verification, and validation should be placed in an appendix if it is too lengthy and detracts from the main body of the text.

Results

In a logical sequence, present, in detail, the findings of the study that either support or provide evidence against the hypotheses or that answer the question(s) presented in the "Introduction". Basic descriptive statistics (sample size, percentages, mean, median, maximum, and minimum) are appropriate when clearly presented. Avoid technical discussions of complex statistical testing; instead refer readers who may be interested in this type of information to an appendix.

Discussion

This section and the "Conclusions" section are the most important parts of the report. Present a clear interpretation of the data that addresses the hypotheses, objectives, or purpose for which the study was conducted. Be sure to include how this research is applicable to the park where it took place, and to other studies that have been conducted in that area of research. Other findings may be reported that would be of general interest to the scientific community.

Conclusions

Provide a specific and detailed summation of the conclusions of the research. In some instances, this is one of the few parts of the report that park managers will read. If the research was initiated

due to specific park management needs, management implications should be emphasized and thoroughly discussed.

Recommendations regarding policy positions of the agency should not be included. If desired, recommendations of this nature should be covered in a special supplementary report separate from the scientific report.

Literature Cited

List all references cited in the report.

Appendices

Include supplementary materials (e.g. QA/QC procedures) that support the main body of the report.

Table 5. Title page format

FLORA OF PETERSBURG NATIONAL BATTLEFIELD

Michael S. Rosenweig
and
Duncan M. Porter

Technical Report NPS/PHSO/NRTR-98/075

Department of Biology
Virginia Polytechnic Institute
and State University
Blacksburg, VA 24061-0324

January 1991
Revised September 1993

Cooperative Agreement
4000-9-8014
Supplemental Agreement 4

National Park Service
Northeast Region, Philadelphia Support Office
Stewardship and Partnerships
U.S. Custom House
200 Chestnut Street
Philadelphia, PA 19106

Mid-Atlantic and Coastal and Barrier Networks
Inventory Study Plan for Vertebrate and Vascular Plant Species

Appendix C

Guidelines for Using Digital Photos as Fish Vouchers For Pennsylvania Fishes

Guidelines for Using Digital Photos as Fish Vouchers

for

Pennsylvania Fishes

Dr. Jay R. Stauffer and Timothy D. Stecko

The Pennsylvania State University

March, 2001

INDEX

Page

Introduction

It may not always be desirable to harvest all fishes collected while conducting aquatic sampling and/or inventories. Species of special concern must often be released on site. The use of hazardous chemicals for tissue fixation and preservation can be prohibitive, and the storage of preserved or live specimens may require resources that are not available or could be put to better use. The use of digital photographs to document which species have been collected can be a suitable method to voucher fish species, addressing the concerns previously mentioned. With the exception of the initial cost of purchasing a digital camera and computer, the costs of digitally vouchering fishes is a relatively economic method of vouchering fish species: there are no film development fees, reproduction of images is essentially without cost, and storage costs of images is negligible.

The guidelines within this document explain how to use digital photographs to accurately voucher fish specimens. Although it may not be possible to identify all fish specimens from digital photographs taken in the field, these guidelines will help with the identification of most fishes collected, thus permitting their release back to the waters from which they were collected. The fish specimens likely to be the most difficult to identify from digital photos are immature fishes of all species and some of the minnow species, particularly in the genus *Notropis*. If the identification of such fishes is necessary, these specimens must be identified on site or properly preserved for later identification.

Choosing the Right Camera

Digital cameras come in many different styles with varying functionality. It is critical that the appropriate camera be selected for use in vouchering fishes with digital photographs. Fortunately, there are many models that meet the requirements for digital photo vouchers. Several specifications that should be met when selecting a camera: 1) color photographs, 2) high pixel density CCD or CMOS, 3) macro capability, and 4) built-in or external flash.

Color Photographs

The color capabilities of digital cameras are often described in terms of color depth. Color depth is the number of colors or shades of which an image is comprised. Color depth is referred to in terms of bits. Camera users will see ratings such as 8-bit, 16-bit, 24-bit, and 32-bit. The bit number refers to the number of binary digits used to code for color or tone. An 8-bit coding scheme uses 8 digits to code for color. Each of the 8 digits can assume a value of a 0 or 1. Thus, a one bit image can have 2 colors or tones, typically black and white. Eight bit images can contain a maximum of 256 colors or shades (2^8=256). This depth of color is insufficient for voucher images. Only at 16-bit or greater do digital images approach photo-realism, and thus better represent the coloration of the specimen. A 16-bit image has a maximum of 65,536 colors (2^{16}=65,536).

The color of the voucher specimens can be a powerful discriminating tool. Colors of fish vary by species, time of year, age, sex, and even geographic location. Unless conditions dictate otherwise, digital image vouchers should be 16-bit color images at a minimum.

Pixel Density

A pixel is the smallest graphical element of a digital image. Each pixel represents a single item of graphical information about the object being photographed. The more pixels comprising an image, the more information about the object you will have. Pixel densities of cameras are typically expressed in terms of horizontal and vertical resolutions. For example, the Olympus C-2500L digital camera has a 2.5 megapixels CCD. The camera claims maximum horizontal and vertical resolutions of 1712 pixels by 1368 pixels. Multiplying the maximum horizontal and vertical resolutions yields a value of 2.34 million (or mega) pixels, close to the 2.5 megapixels rated CCD. Obviously, not all of the CCD's 2.5 megapixels are used in the final image. But, this example does explain the basics of the pixel densities/CCD and image resolution relationship. It is important to have images with resolutions of at least 1024 pixels by 768 pixels, simply expressed as 1024X768. Larger images would provide more information upon which to base an identification. Factors such as camera specifications and available storage memory will limit the size of the digital image being captured. Each user must determine how large these images will be.

Macro Capability

The most difficult of fishes to identify are often the smallest ones. To identify such fish it is necessary to take large photos of these small specimens. To take photos of small objects the camera must be able to focus on objects that are very close to the lens. When selecting a camera for this use, choose one that is able to focus on images as close as 4 cm. Some macro features on digital cameras will allow even shorter focal distances, which can also be useful.

Built-in or External Flash

The use of a flash can serve two purposes, provide adequate lighting, and increase shutter speed. Proper lighting will highlight the specimen's natural colors, assisting in an accurate identification, and permit photography in low light conditions. The fast shutter speeds are critical when taking photos without the use of a tripod or some other device for stabilizing the camera. Even the most steady of grips can produce miniscule movements that can blur images. In full sunlight, shutter speeds are very fast and hand held shots can be exceptional. When light conditions are low, a flash will compensate for the lack of natural light, producing fast shutter speeds and crisp photos. If possible, use natural light by moving specimens from the shade to full sun.

Photographing Specimens

Once a suitable camera has been selected, particular attention must be paid to a number of aspects of the image collection and handling process. When photographing the specimens you must make the most of the field of view, provide references for determining size and the identification of individuals. The handling of images involves the naming of image files, addition of voucher information to the image, and selection of file formats.

Field of view

As a rule, when taking voucher photos, it is best to fill as much of the field of view as possible with the subject (Figure 1). The macro option of your camera will be useful when photographing small fish or when photographing particular structures or areas of the specimen.

Figure 1. Photo A (*Rhinichthys atratulus*) depicts an improper use of the field of view. Photo B (*Rhinichthys atratulus*) shows a proper use of the field of view. Photo B is much more useful as a voucher photo.

Size referencing

The size of the specimen is important information to document. Size can be helpful in the identification process and assessing population characteristics, such as presence of breeding age individuals and health factors. It is therefore important to provide a means of estimating size for each specimen photographed. By simply including a tape measure, meter stick, or some calibrated device, size can be estimated from the photographs (Figure 2).

Figure 2. Image of *Catostomus catostomus* from Whites Creek, Somerset County, PA. The measuring tape in the upper portion of the image can be used to estimate the length of the specimen. Additionally, the tape can be used to assign a number to the individual for this collection site. Notice the mechanical pencil pointing to the number 3 on the measuring tape. A text label has also been added to the lower right part of the image. This text label provides information regarding species identity, specimen number, collection site, collecting institution, collection number, and date of collection.

Identification of individuals

Often more than one individual will need to be vouchered. Therefore it will be necessary to identify individuals from the digital images. Figure 2 demonstrates a simple method of assigning a number to each individual collected. If larger numbers of individuals are being vouchered, another system of numbering will likely be needed, as a tape measure will provide limited numbers and could become awkward to use.

Saving files for voucher purposes

File format and compression

In most cases, you will have two opportunities to select the file format and compression quality. The first opportunity will arise prior to taking the photos. Digital cameras allow the user to select different image qualities for image storage. The highest quality is typically and uncompressed format know as TIF. This format requires a great deal of space for storage and can seriously limit the number of images you can save on your cameras storage device. Even though this format will be the highest quality permitted by the camera, the gain in image quality is minimal compared to high or even medium-high quality compressed images and the loss of storage room for additional images makes it less desirable (Figure 3). Be aware that printed images may not be as clear as there digital originals. The originals can be zoomed in on to view greater detail and are not compromised by the limitations of a printing device.

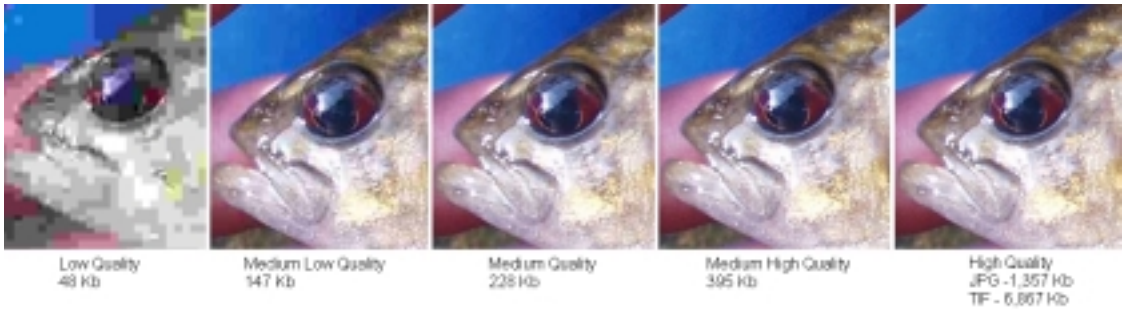


Figure 3. These five images represent different graphics file qualities as determined by the degree of compression of the jpeg file format. Also presented are the respective file sizes. Note that low quality results in a very small file size and poor image quality, while high quality results in a very larger file size and excellent image quality. A balance between file size and image quality must be found.

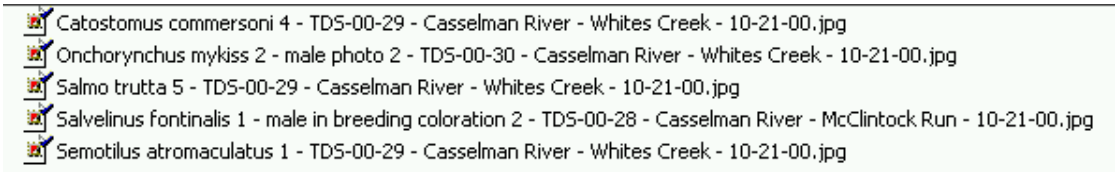
Cameras will usually allow for the storage of images in compressed jpeg format. The degree of compression or size of the captured image may also be selected. Always choose the physically largest image available, largest in terms of the horizontal and vertical resolution. Large images capture more detail and are better for identification. Some of the more highly compressed image options can degrade the image somewhat

(Figure 3). It is best to choose medium to high quality jpeg formats so as not to reduce image quality. After all, there is no point in making efforts to improve image quality by optimizing lighting and stabilizing the camera only to lose these gains by choosing a low image quality compression ratio.

File names

When the camera captures a digital image it will automatically assign a name to the file. The name is typically a combination of alpha and/or numeric characters that give no indication as to the file contents. Giving the file a descriptive name will help users identify the file without having to view the image. Furthermore, descriptive names can be very useful when searching hard drives, CD-ROMs, or other computer media for images of a particular content. For instance, if the file name contains the name of the species, one could find all voucher images for that species on a computer simply by searching filenames for the species name. The renaming of digital images is best done on a computer soon after the images are captured. Information that should be included in the file name is; species scientific name (if identified), individual identifying number, collection site description or collectors reference code, and date of capture. If the specimen has not been identified, this information can be added at the time of identification. The individual identifying number was described in a previous section. Review the section titled "Identification of individuals" for more information. A description of the collection site can also be useful. The collector's reference code is a code, catalogue number, or some marker that provides information about the sampling event that resulted in the collection and subsequent digital image vouchering of the specimen. For instance, the image in figure 2 has been tagged in the lower right corner with additional information. The line labeled "Coll. ID" contains a string of characters that refers to the collector's field code for a very specific collection. This is a unique code assigned by the investigator. No other collections by this investigator have this code. Referencing this code will provide access to more detailed information about the collection, the site, collection crew, sampling methods, etc. All investigators conducting fisheries sampling should keep copious field notes and assign such codes to their sampling efforts. Table 1 lists examples of file names that provide good descriptions of their contents.

Table 1. A list of file names. The name of each file provides useful descriptive information regarding the nature of the digital image file.



File names are useful in identifying file subject matter and in performing searches for files of particular content. However, file names can become corrupted, thus eliminating crucial information about the image. Corruption of file names, although not common, can be a problem when sharing files with long names between different computing platforms (i.e., Unix, Macintosh, Windows XX). To preserve the link between image and collection information, one must include this information as part of the image itself. The text in the lower right corner of the image in Figure 2 contains all the information necessary to determine the images origins and content. Only if the image becomes corrupted will the voucher be rendered useless. There are a variety of methods to incorporate text into graphics. It is not necessary to use an expensive graphics software package for the addition of text. The user should familiarize his or her self with the various graphical software packages available. Almost all camera manufacturers will distribute software with the digital camera that is more than capable of this task.

Rules for Capturing Voucher Images of Fishes

This section discusses the types of digital photographs that will be helpful in the identification of fish species. Specifically, the photographic viewing aspect for each fish family or type of fish will be discussed. Not all fishes can be identified from voucher images. Fortunately, with the following of the aforementioned guidelines and the application of a few simple rules, most fish species, particularly those of a threatened or endangered status, can be successfully identified from digital images.

Because it is likely that individuals taking the voucher photos will have varying degrees of fish identification experience, voucher photo instructions will be provided as two methods. Each method is based on the concept that species can be identified from digital images provided that the appropriate view or views are captured by the images. A description of the views used is provided below. Method one will provide generalized instructions directing the user to take photos of a particular aspect based on easily discernable features of the specimen. Method two will provide photo instructions for individuals capable of identifying fishes to family.

Description of photographic views

Every effort should be made to photograph the left side of the fish. This has been the conventional view, because much of the physical work done on preserved fishes is done on the right side, often damaging tissues and blemishing the specimen's appearance. If the left side is of poor quality, the right side may be used.

Lateral View – Side view of specimen from tip of snout to the end of the tail.

Oral Disk – Applies to lampreys only. Clear view of mouth opening and teeth. Allowing lamprey to attach to a piece of glass or plexiglass can help expose oral disk.

Lateral closeup of head – Side view of head from tip of snout to beginning of pectoral fin.

Ventral view of head and jaw – Bottom view of head from tip of snout to the end of the gill covers.

Clear view of dorsal and caudal fins – Make sure the dorsal fin(s) and caudal fin are clearly visible. Both fins should be flared, exposing fin structure and pigmentation.

Ventral view of pelvic fins – Bottom view of pelvic fins. Must be able to count rays in fins.

Clear view of anal fin – Can be complete snout-to-tail lateral view of specimen. May need to manually flare anal fin to expose anal fin spines.

Method 1

This method can be applied with very little knowledge of fish identification, although a basic knowledge of fish anatomy is required. Field guides, such as The Peterson Field Guide Series "A Field Guide to Freshwater Fishes – North America North of Mexico" provide information concerning fish anatomy. Users of this method must follow the information in the order it is presented. When determining which view or views to photograph, start with row number one in the table below and progress sequentially until the proper view is determined.

	Features to look for	**Example Image**	**View to Photograph**
1)	Specimen is snake-like and lacks a boney jaw LAMPREYS		-(adults) lateral view & view of oral disk -(juveniles) keep specimen
2)	Specimen lacks or has few scales, has large head and mouth, two dorsal fins, no barbells present on chin, specimen usually < 15 cm SCULPINS		**best to keep specimen** -(all specimens) lateral view, ventral view of pelvic fins

	Features to look for	Example Image	View to Photograph
3)	Specimen has 2 dorsal fins that are separate or very narrowly joined. Three anal spines present, spine present on opercle TEMPERATE BASSES		-(all specimens) lateral view & clear view of anal fin
4)	Long snout, dorsal fin much closer to caudal fin than the head, forked tail PIKES		-(adults) lateral view & lateral closeup view of head -(juveniles<10 cm) keep all specimens or views same as adult

	Features to look for	Example Image	View to Photograph
5)	Specimen is scaleless, has chin barbells, has adipose fin which may be connected to caudal fin CATFISHES		- (all specimens) lateral view (clear view of dorsal and caudal fins) and ventral view of head and chin
6)	Body is scaled, does not have an adipose fin, has a single, separate dorsal fin, front of dorsal fin is about in the middle of the body or closer to the head, pelvic fins are about midway between pectoral fins and anal fin or closer to anal fin. SUCKERS & MINNOWS		- (adults) lateral view & ventral view of head and jaw – (juveniles) – same as adults or keep specimen
7)	ALL OTHER FISH		Lateral view

Method 2

Users of this method must be able to identify fish to family level. Below is a list of families and their respective photographic views.

Petromyzontidae (Lampreys) – (adults) lateral view & view of oral disk – (juveniles) keep specimen
Acipenseridae (Sturgeons) – lateral view
Polyodontidae (Paddlefish) – lateral view
Lepisosteidae (Gars) – lateral view
Amiidae (Bowfish) – lateral view
Anguillidae (Freshwater eels) – lateral view
Clupeidae (Herrings) – lateral view
Hiodontidae (Mooneyes) – lateral view
Salmonidae (Trouts) – lateral view
Osmeridae (Smelts) – lateral view
Umbridae (Mudminnows) – lateral view
Esocidae (Pikes) – (adults) lateral view– (juvenile < 25 cm) – lateral view & lateral closeup of head
Cyprinidae (Minnows) - (adults) – lateral view & ventral view of head and jaw – (juveniles) – same as adults or keep specimen
Catostomidae (Suckers) - (adults) – lateral view & ventral view of head and jaw – (juveniles) – same as adults or keep specimen
Ictaluridae (Bullhead Catfishes) – lateral view (clear view of dorsal and caudal fins) and ventral view of head and chin
Apherododeridae (Pirate Perch) – lateral view
Percopsidae (Troutperches) – lateral view
Gadidae (Codfishes) – lateral view
Fundulidae (Topminnows and Killifishes) – lateral view
Poeciliidae (Livebearers) – lateral view
Atherinidae (Silversides) – lateral view
Gasterosteidae(Sticklebacks) – lateral view
Cottidae (Sculpins) – lateral view, ventral photo of pelvic fins, best to keep specimen
Moronidae (Temperate Basses) – lateral view – flare anal fin
Centrarchidae (Sunfishes and Basses) – lateral view
Percidae (Perches) – lateral view
Sciaenidae (Drums) – lateral view
Gobiidae (Gobies) – lateral view

Mid-Atlantic and Coastal and Barrier Networks
Inventory Study Plan for Vertebrate and Vascular Plant Species

Appendix D

Preproposal for Biological Inventories: Mid-Atlantic Network

Preproposal for Biological Inventories: Mid-Atlantic Network

Introduction

This pre-proposal describes the approach to be used by 10 Mid-Atlantic parks in the Northeast Region to initiate biological inventories of vertebrates and vascular plants as described in the "Guidelines for Biological Inventories". The eight parks will work together to

1. inventory, organize and compile existing data;
2. identify data gaps and determine priorities and the level of detail required for additional field sampling; and
3. develop a full study plan that describes the spatial sampling strategy and methodology for collecting additional information, as well as listing the products to be generated by the inventories.

SHEN, PETE, FRSP, RICH, BOWA and APCO were contacted by phone, email and at a recent meeting to:
1. describe the new direction/ goals for biological inventories,
2. discuss the new guidelines,
3. review the differences between inventories and vital signs monitoring,
4. gather information on the status of inventories in each park, and
5. identify species or habitats for which detailed distribution and relative abundance measures are needed.

VAFO, HOFU, GETT and EISE were contacted at a meeting in Penn State for which a separate proposal was drafted for inventory in the western PA parks.

The NPSpecies database was emphasized as a means to manage inventory data. Parks were asked to send information on vertebrates and vascular plants (documents and species databases) to the Washington I&M Program. These documents would be used to populate the NPSpecies database with documented occurrence information for vertebrates and vascular plants.

For this pre-proposal, parks were asked to provide
1. a report on the status of biological inventories,
2. a description of the park and its management issues,
3. a preliminary list of species for which relative abundance and/or distribution information was needed and a justification of that need and
4. a list of outside “experts” that might participate in a scoping session to refine both species lists and inventory needs assessments

Park Descriptions and Resources

Parks in the Mid-Atlantic Network lie in two states, PA and VA. These states have often represented both an administrative and a project boundary since the PA parks often work together (and include 4 other PA parks) and the VA parks often work together (and include 3

other VA parks). Pennsylvania parks include Gettysburg National Military Park (GETT), Eisenhower National Historic Site (EISE), Hopewell Furnace National Historic Site (HOFU) and Valley Forge National Historical Park (VAFO). The Virginia parks include Appomatox Court House National Historic Park (APCO), Booker T. Washington National Historic Site (BOWA), Fredericksburg and Spotsylvania National Military Park (FRSP), Petersburg National Battlefield Park (PETE), Richmond National Battlefield Park (RICH) and Shenandoah National Park (SHEN).

Booker T. Washington National Monument (BOWA) is comprised of 224 acres of forests, open woodland and meadow, hayfields, pasture, demonstration cropfield and garden areas, and maintained turf. Agricultural and forested lands cover more than 80% of the park's land base. There are approximately 40 acres in crop/hay production, 24 acres in pasture, 149 acres of woodland. The forests are a mosaic of vegetation types, ranging from 30 to 100 years old with the dominance of forest types being approximately 45% tulip poplar, 25% oak-hickory, 20% pine, and 10% riparian. The forests appear to be in a successional oak replacement phase and possess a unique mix of higher elevation Central Appalachian mixed deciduous forest species along with various bottomland species. The park receives about 20,000-25,000 visitors a year.

Critical management issues that a biological inventory might address includes cultural landscape management, viewshed analysis and protection, presence of threatened & endangered species and other sensitive species, air and water quality, exotic vegetation, environmental education, facilities development, trail development with interpretive media, and interpretive programming. The need to acquire information about the resources at BOWA and their conditions is immediate. Changes in patterns of land use adjacent to and surrounding the park are happening at an accelerated rate. As land use changes occur, the undisturbed natural ecosystems at BOWA become more of a virtual oasis. Forested areas of the park have remained unchanged for over one hundred years, after being abandoned for agricultural uses. NPS resource management specialists and scientists conducting site assessments at the park recently have determined the park's forests to be "geographically unique" in that they host plant and tree species that are now considered to be somewhat out of their normal home ranges. As farmland and forests in the areas surrounding the park are fragmented and destroyed, the park's forestland will continue to become more unique and in need of attention and protection. The park needs to know what plant and animal species live within park boundaries now, the condition and size of their populations, and how land use changes in the surrounding areas will affect populations as other plants and animals migrate in and out of the park**.**

FRSP was established in 1927 to commemorate four separate, major battles of the Civil War: Fredericksburg (1862), Chancellorsville, including Salem Church (1863), Wilderness (1864), and Spotsylvania Courthouse (1864). The park has nine principle units spread out over 100 sq. miles of Virginia countryside. It has an authorized boundary of some 8,500 acres, of which 7,100 are currently owned and/or managed by the Service. Located in the fastest growing area of Virginia, the agricultural setting of the park is fast being converted to a combination of sub-divisions and commercial strip malls. Park use has reached as high as 2 million, but most recently is about 1.6 million. The park has an active farm program that

currently manages over 900 acres of park historic scene. Another 1,000+ open aces are managed (bush hogged) by park maintenance staff. Crisscrossed by numerous streams, and containing substantial wetlands and a diverse wildlife population, the park is rapidly becoming the only open space in the community. Park wetlands have been mapped and there have been some preliminary inventories of R,T&E species, but very little baseline information exists on the park's biotic communities. Exotic species are an issue as are deer.

PETE was established to commemorate the 10-month siege and defense of Petersburg, Virginia, in 1864 and 1865 and to preserve for historical purposes the defenses or shelters used by the armies. The park is comprised of 10 units and 2,760 acres. Annual visitation is about 450,000. The largest Units are between 70-92% forested and the remaining area is grasslands, open fields, wetlands and streams. Continued urbanization is isolating the battlefield units and some land uses (a new steel plant adjacent to the park) may impact on park resources. Cultural Landscape Reports and Treatment Plans are needed or underway. Development is planned in formerly undeveloped units when the GMP is approved.

GETT is primarily agricultural (50%), 37% forested and the rest-developed lands and includes 10 ponds, numerous small wetlands, and three drainages. EISE is 83% agricultural with two drainages in the park. White-tailed deer are a routine maintenance issue at GETT and EISE and management of invasive exotics and population monitoring of state-listed species habitats are critical at this time.

HOFU is 75% forested with agricultural and developed land included. Management of the cultural landscape and exotic species are important issues.

RICH, created in 1936, is comprised of 11 individual units spread out over 3 counties and the City of Richmond (approximately 132 sq. miles) this 762-acre battlefield park commemorates the Siege of Richmond, the Confederate capital during the Civil War. The park is 70-75% covered with a mixture of oak-hickory-pine forests. Like so many eastern parks, the surrounding area is rapidly being converted from farms and forests to sub-divisions and industry. A new GMP, prepared in 1996, recommends establishing a legislative boundary of 7,200 acres, but to date the needed legislation effort has been unsuccessful. A soon to be donation by the Civil War Preservation Trust will serve to double the size of the park to 1,500 acres with addition of a 700 acre tract at Malvern Hill, though. The park relies on an active farm program to maintain the cultural setting in its larger units, and has been successful in undertaking a number of Cultural Landscape Reports (Gaines' Mill and soon Malvern Hill). A "Water Resources Management Plan" and an "Inventory of Wetlands – Parkwide" have recently been initiated and are scheduled to be completed in 2001. Both studies will provide much needed baseline inventories of park resources/

VAFO is 57% old fields and managed meadows and 38% woodlands including wetlands. Streams and a river bisect the park. VAFO is surrounded by urban/suburban landscapes where deer are an issue. Lack of baseline data and exotic species management are critical issues as is management of meadows.

Summary of Existing Inventories

Various Penn State research associates, most recently Jen Mravintz, have gathered and verified a tremendous amount of vertebrate and vascular plant information for these 9 Parks. This information has been provided to WASO I&M as an NP Flora and Fauna database. These data are now in the NPSpecies database. In addition, Jen has been working with the parks to identify additional documentation of species occurrence in parks. She has provided her list of contact for voucher specimens to the I&M program. Table 1 shows the number of species documented (and verified) in each park in the Mid-Atlantic network.

Table 1: Number of Mid Atlantic Network Species documented in NRBIB citation

PARK	INVENTORY	NUMBER of SPECIES and NRBIB citation
APCO	Plants	28 species in NRBIB: PHSO - 0087
BOWA	Mammals	20 species in NRBIB: PHSO - 00200
	Plants	97 species in NRBIB: PHSO - 002004
SHEN		Not included in this summary project
FRSP	Plants	4 species in NRBIB: FRSP - 0037
	Birds	1 species in NRBIB: FRSP - 0037
	Plants	81 species in NRBIB: PHSO - 00128
	Plants	58 species in NRBIB: PHSO - 0056
	Plants	181 species in NRBIB: PHSO - 0054
	Plants	130 species in NRBIB: PHSO - 00564
RICH	Plants	635 species in NRBIB: PHSO - 0027
	Plants	3 species in NRBIB: PHSO - 0034
GETT	Plants	61 species in NRBIB: PHSO - 0474
	Plants	299 species in NRBIB: PHSO - 0553
	Birds	179 species in NRBIB: PHSO - 0643
	Mammals	21 species in NRBIB: PHSO - 0644
	Herps	25 species in NRBIB: PHSO - 0699
	Fish	38 species in NRBIB: PHSO - 0686
EISE		
HOFU	Plants	46 species in PHSO - 0684
	Plants	504 species in HOFU - 0168
	Plants	41 species in PHSO - 0068
	Birds	193 species in NRBIB: PHSO - 0643
	Mammals	18 species in NRBIB: PHSO - 0644
	Herps	21 species in NRBIB: PHSO - 0699
PETE	Plants	81 species in NRBIB PETE – 0017, PHSO - 00564
	Plants	181 species in NRBIB PETE – 0020, PHSO - 0054
VAFO	Plants	371 species in NRBIB: PHSO - 0024
	Birds	58 species in NRBIB: PHSO - 0024

	Birds	208 bird sp. seen by park staff in NRBIB: PHSO - 0313
	Mammals	14 species in NRBIB: PHSO - 0024
	Herps	12 species in NRBIB: PHSO - 0024
	Fish	31 species in NRBIB: PHSO - 0686

TABLE 2: Status of Biological Inventories for Mid-Atlantic Parks

PARK	**PLANTS**	**BIRDS**	**HERPS**	**MAMMAL**	**FISH**
APCO	**Incomplete**	**Incomplete**	**Incomplete**	**Incomplete**	**Incomplete**
BOWA	**Incomplete** 1986 flora by Critz, 1989 flora by Mehjak herbarium at Ferrum College, 193 species	**Incomplete,** 1991 list of animals by VA Game and Fish	**Incomplete,** 1991 List of animals	**Incomplete,** 1986 fauna inv. Litton & Rabenau 1991 List of Animals	**Incomplete,** 1991 list of animals
FRSP	**Incomplete**	**Incomplete**	**Incomplete**	**Incomplete**	**Incomplete**
RICH	**Incomplete**	**Incomplete**	**Incomplete**	**Incomplete**	**Incomplete**
PETE	**Incomplete**	**Incomplete**	**Incomplete**	**Incomplete**	**Incomplete**
SHEN					
GETT	Complete, 299 species 12 listed species, need exotics	Underway by PSU 179 species	Underway by PSU 25 species	Complete 38 species	Complete by PSU, 21 species, bats and shrew distr. Of interest
EISE	Complete, need exotics	Underway by PSU	Underway by PSU	Underway for 99-00 complete	Complete by PSU, same as GETT
HOFU	Complete by Russell and Bowersox, 504 species Need exotics,	Underway by PSU 193 species	**Incomplete** 21 species	**Incomplete ?**	Complete by PSU 18 species
VAFO	Complete 371 species 12 state listed sp, 10 targeted exotics are mapped	Underway by PSU, 208 species	Underway by WCU 12 species	Complete by PSU 31 species	Complete by PSU, 14 species need bats in structures + caves

Park Specific Objectives for Inventory

Invasive species are a problem in all of the Mid-Atlantic parks. The VA parks worked together with leadership from SHEN to develop a proposal for invasive plant control that was funded by NRPP. The PA parks need such an initiative as well.

At PETE, wetland habitat distribution is needed to set priorities and initiate management actions that may impact on those habitats..
Distribution and abundance of State listed plants are a priority at VAFO, GETT and EISE. A state listed shrew was discovered at GETT and EISE for which more detailed information is needed. Distribution of bats in park habitats (including structures that might be slated for removal) is needed to protect these species.

BOWA is planning a terrestrial vertebrate inventory with M. Menjak, Ferrum College. A $5999 pre-proposal approved. Plant data are gathered whenever area college majors are available to identify plants. Some work was done fall 99, still waiting for report.

Baseline data is needed in most Mid-Atlantic parks.

Parks in the Mid-Atlantic network vary greatly in resource management staff capabilities. SHEN has been a prototype park for many years, and has subject matter experts on staff. The resource management contact at APCO ,RICH and BOWA is the Superintendent, the Chief of Interpretation and Resource Management or a field resource management/law enforcement ranger at HOFU. This network will rely heavily on the experience of SHEN in inventory and monitoring. Although even SHEN may have some gaps in vertebrate and vascular plant inventories.

TABLE 3: Park contacts for the Mid-Atlantic Network

SHEN	Tom Blount, I&M Wendy Cass, botanist	540-999-3497 540-999-3432
APCO	Reed Johnson, Superintendent	804-352-8987
BOWA	Tina Orcutt, Chief Interpretation & Resource Mgt Timbo Sims, Park Ranger, Resource Mgt Coord.	540-721-2094
FRSP	Gregg Kneipp, Resource Manager (new)	540-785-7448
RICH	Mike Johnson, Chief Ranger FRSP and RICH	540-654-5535
PETE	Dave Shockley, Resource Management Tim Blumenschine	804-732-0171
GETT/EISE	Bert Frost, Wildlife Biologist	717-338-1514 x 10
GETT/ EISE	Curt Musselman, GIS	717-334-4401
HOFU	Ed Clark, Resource Management Ranger	610-582-8773 x 226

VAFO	Scott Kalbach, Chief Ranger	610-783-4046
VAFO	Brian Lambert, Resource Manager	610-296-2583
PSO	John Karish, Chief Scientist	814-865-7974
NER	Beth Johnson, I&M Coordinator	401-874-7060

Preliminary Plan for Biological Inventories in Mid-Atlantic Parks

The Mid-Atlantic network will spend 65 K to complete steps up to and including development of a full study plan. We plan to:

1. update the NRBIB using a Penn State research associate supervised by Scott Tiffany,
2. use NCState University Field Technical Support Center to develop a dataset catalog for spatial data and assess the compatibility of existing spatial data and the arc view data browser,
3. hire a research associate at Penn State to continue to fill in the NPSpecies database and to fill in the dataset catalog for other than spatial data.
4. Hold a scoping workshop to refine inventory objectives
5. Write a workshop summary
6. Seek cooperators to fill in priority data gaps and to write a full study plan

We will identify experts, as a part of development of a full study plan to fill in as many gaps as possible with the limited funding this network is to receive. These experts will be interviewed to facilitate contribution to existing data. A select few will be invited to participate in a scoping workshop to evaluate park priorities and suggest additional inventories. The parks will have the final decision on what will be accomplished by the full study plan. This network will likely NOT be able to complete biological inventories for vertebrates and vascular plants according to the Guidelines for Biological Inventories. There may be as many as 27 incomplete inventories for the Mid-Atlantic network. If 20K per taxa were an estimated average, the task of documenting 90% of the species would supposedly require over 500K. This amount may not be available.

TOTAL REQUEST: $ 65,000